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Management for made-to-order manufacture

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Division, United Aircraft & Transport Corporation

IN the past two or three years, volumes have been written above aviation, and during the months of unprecedented interest and activity which followed a series of spectacular long-distance flights it was generally considered that a struggling industry had come into its own. Not only was the public treated to a deluge of stories of flying feats, but it read about all phases of aviation as well. It seemed quite natural to associate the airplane with the automobile, and in articles on manufacturing the statement was often made that aircraft builders were profiting by the experience of the automobile industry in regard to production methods—the idea being that with planes to build in quantities, "mass production" could be adopted.

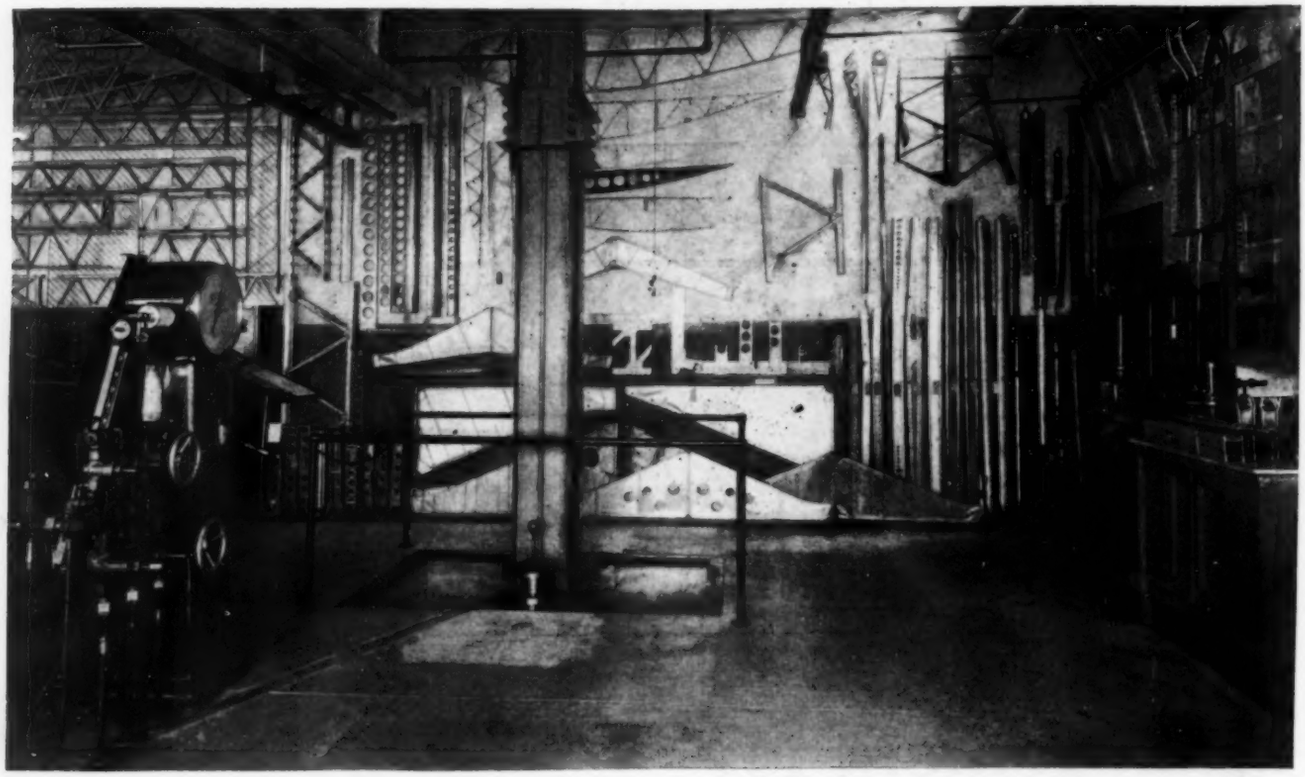
Unfortunately, none of the manufacturers of aircraft has gotten into real production, nor is airplane production likely to be in a class comparable with that of the automobile industry for several years, simply because there is not yet a sufficient market for any one type. New developments are rapid and changes in design are often radical, so that a manufacturer's set-up for producing a certain type of airplane may be entirely different from that needed for the next type he adopts.

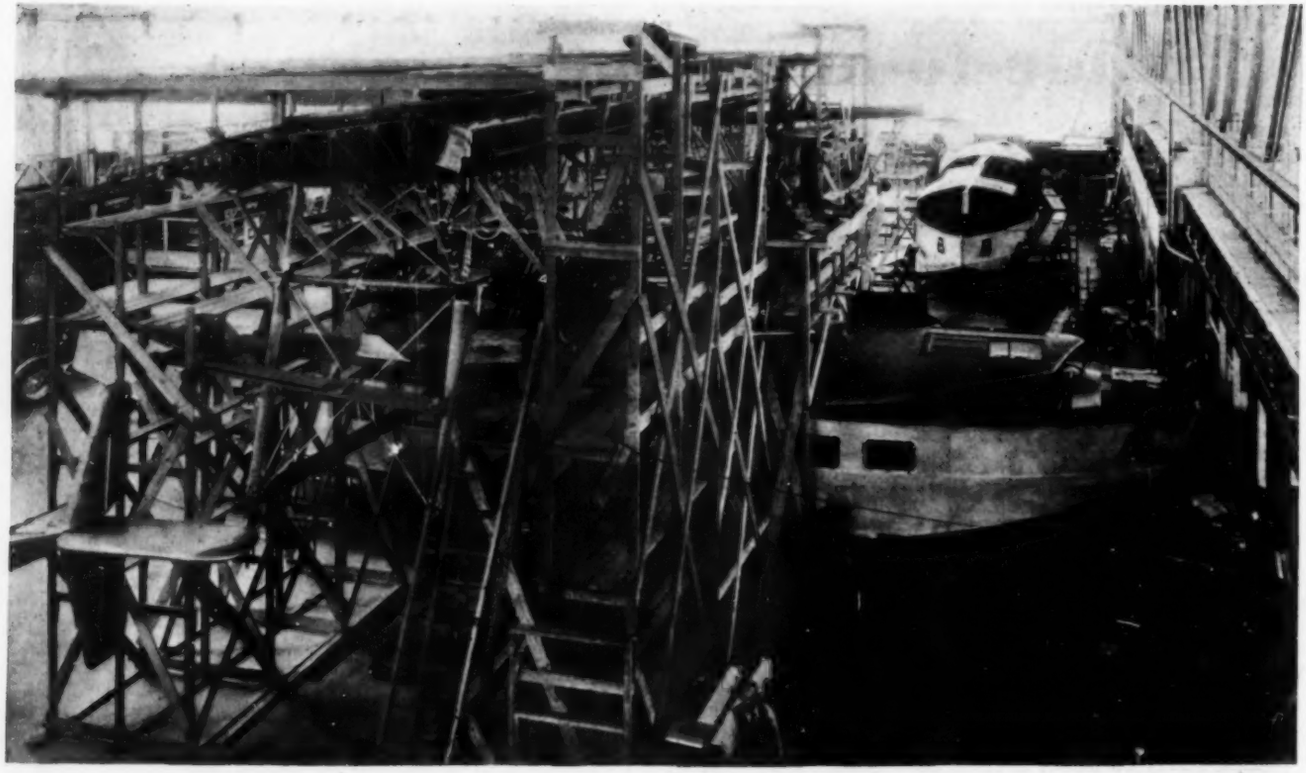
For example, an automobile manufacturer knows from year to year that his car will always be the same width, will have a maximum height of, say six or seven feet, and will vary slightly in length. An airplane manufacturer, however, never knows what the next year's developments will bring. A change in load or passenger capacity means an increase in wing surface. An increase in span of ten feet might be necessary to gain this area and all previous lay-outs would have to be scrapped.

When the new Bridgeport (Conn.) factory of the Sikorsky Aviation Corporation was planned, the engineers knew their big problem was to build a factory flexible enough to accommodate the changing requirements of the aviation industry. The Sikorsky Company was building large amphibion planes. With still larger ones contemplated, this problem of flexibility was not a small one. The same plan had to be carried out in equipping the factory.

Anything of a permanent nature was avoided where possible. Spray booths, ovens, tanks and machinery were all installed with the idea that they could be readily moved to another location if found advisable. In buying equipment, where size was an important factor, the tendency was to favor the least expensive in order to keep down the investment should a change be found necessary later on.

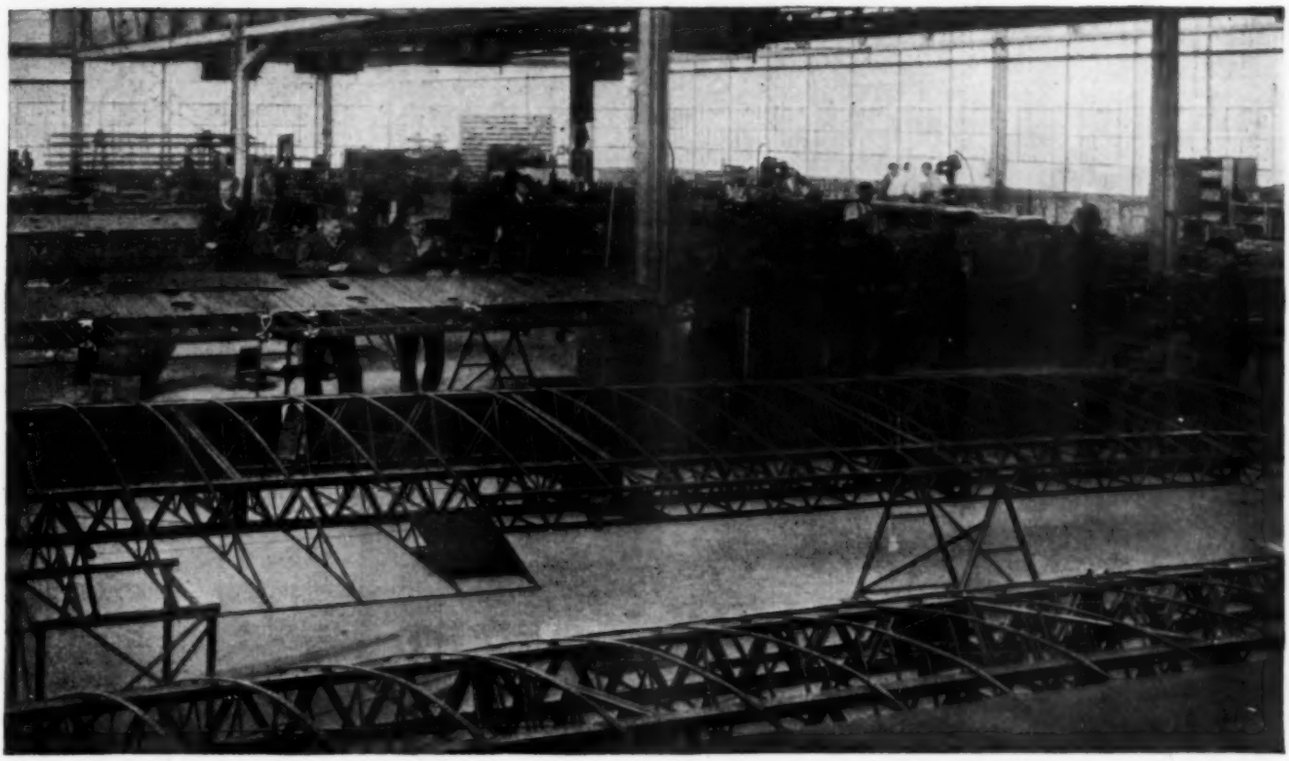
In the selection of machine tools the policy was to in-





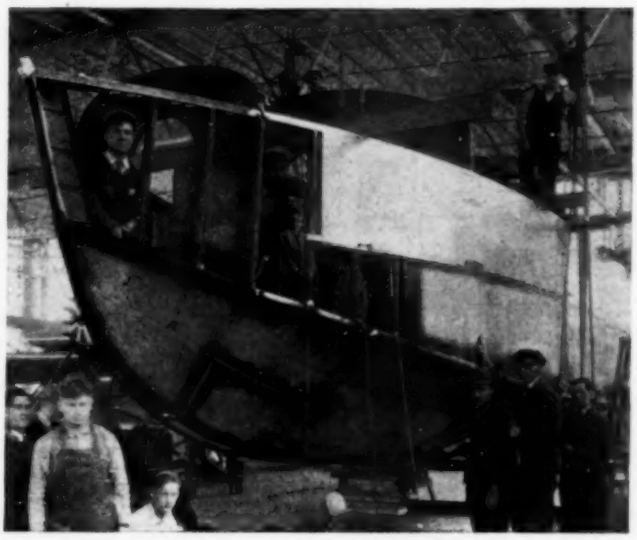
stall only standard types and sizes that would take the greatest range without being extreme. Milling machines, for example, are practically all medium size. Although most of these are of the plain type, a sufficient number of vertical attachments and other accessories are provided to obtain maximum utility from them. The production machine shop was also provided with a few universal millers, which in a great many cases eliminate the necessity of making special tools and fixtures for only a few pieces. No machinery was installed which was designed to turn out any one part in large quantities.

Most of us are familiar with the fact that in the automobile industry many machines are employed which are specially designed and built to perform single operations.



Left top—A view in the experimental laboratory, showing some tested specimens. Left—Staging necessary to assemble a large plane. Taken at approximately the center of the assembly line. Above —The wing shop. Below—Assembling the hull of a 40-passenger amphibion. An idea of the size and methods of construction is given.

This condition is somewhat approached in the manufacture of aviation engines, because there are some models of engines that can be and are used in several types of plane. If the engine consists of nine cylinders, for example, the quantities of certain parts to be manufactured reach a figure that justifies special production machinery. But when we realize that in aviation's best year so far (1929), only 6,034 commercial and military airplanes were produced in the United States, it is easy to understand why no airplane manufacturer can adopt mass production methods such as those employed by the makers of automobiles.



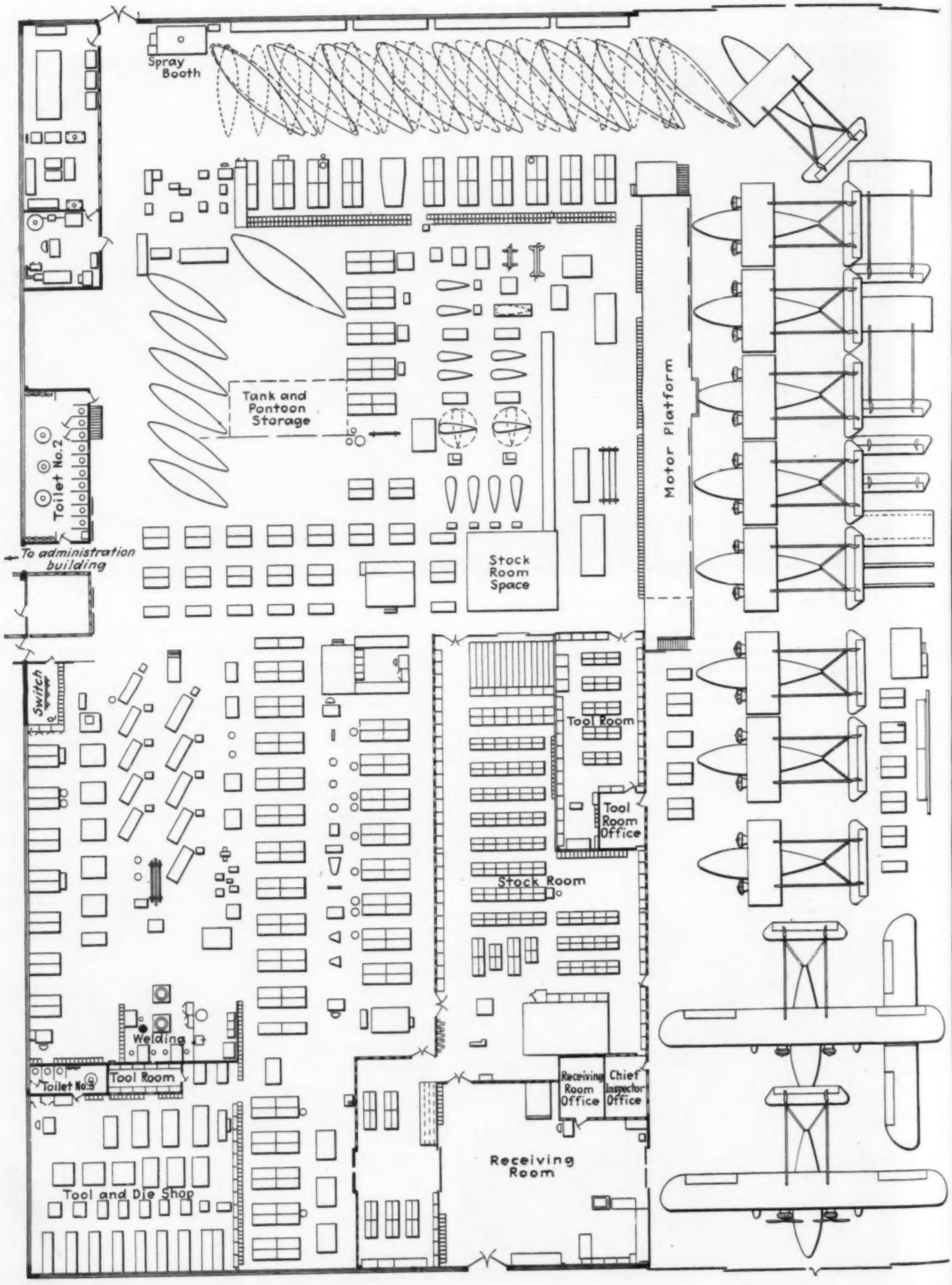
At the Sikorsky plant the complete airplane, with the exception of the engines, instruments and some of the accessories, is built in one building. There are many parts which theoretically could be made to better advantage by other manufacturers who specialize in certain lines, but practically this is impossible. The possibility of engineering changes, the requirements of inspection and the difficulty of controlling deliveries make it highly undesirable to contract for parts to be made by outside companies.

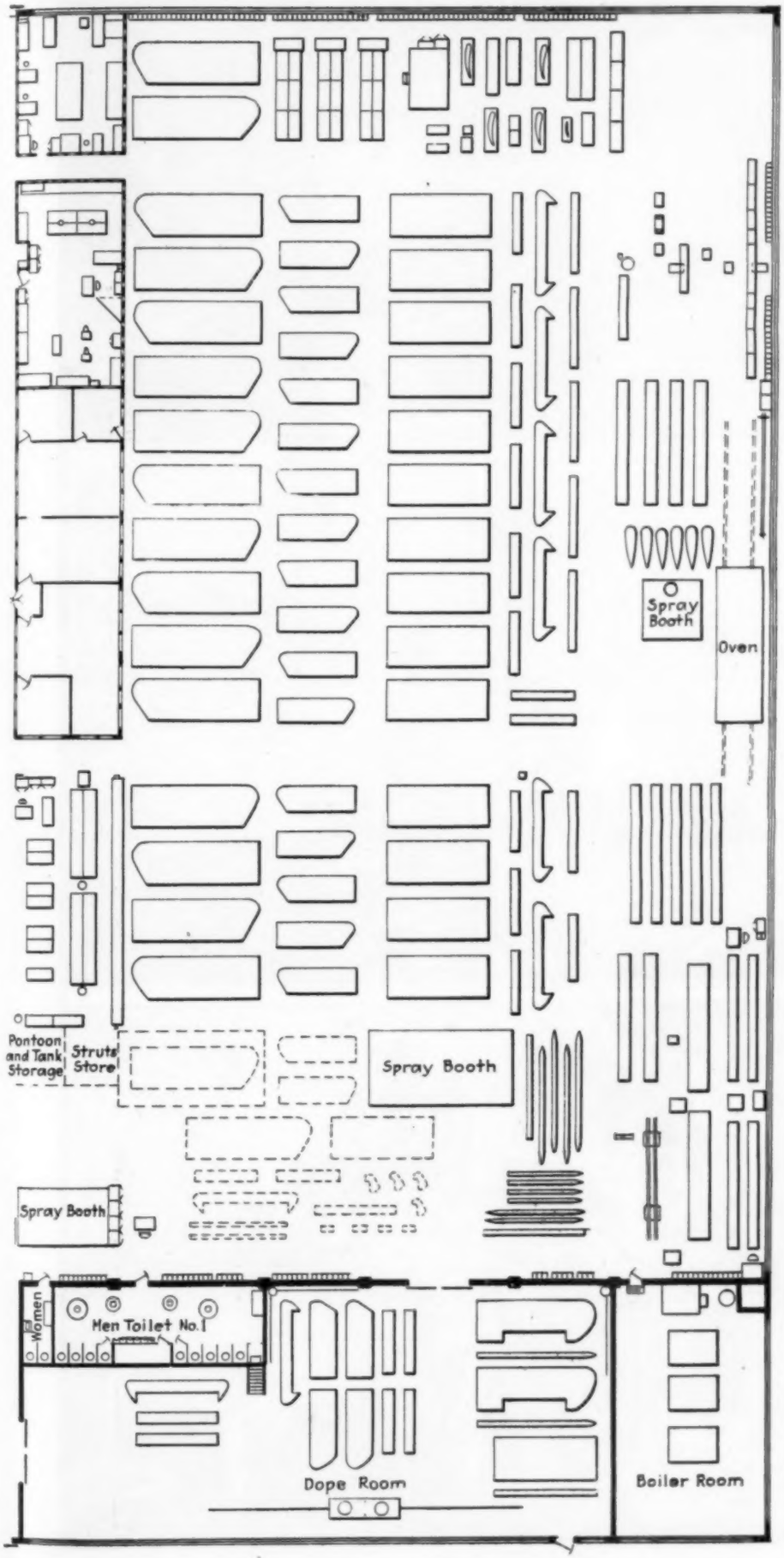
It was, therefore, necessary in equipping the factory to choose machinery and tools which would allow the manufacture of parts at a minimum cost for the quantities involved, but which at the same time would not be rendered obsolete by engineering changes or made idle because of non-adaptability to a variety of uses.

All machinery is motor driven and self-contained. Although this principle is not considered as economical as the group belt drive, it is cleaner, safer and allows an unobstructed view of the shop. The greatest advantage, however, is in the flexibility obtained. In case a rearrangement of machinery is desired to suit a different manufacturing scheme, moving can be done with a minimum of effort and loss of time.

The main manufacturing plant is a one-story building of 100,000 sq.ft. The assembly bay, 80 ft. wide, 35 ft. high and 250 ft. long, runs through the center. On each side are three bays 20 ft. wide and 12 ft. high and three bays 30 ft. wide and 20 ft. high.

On the west side of the building are located the stockrooms, machine shops and sheet metal shops, where hulls, pontoons, fuel and oil tanks are made.


Spray Booth
Tank and Pontoon Storage
Toilet No.2
To administration building
Stock Room Space
Motor Platform
Switch
Tool Room
Tool Room Office
Stock Room
Welding
Toilet No.3
Tool Room
Receiving Room Office
Chief Inspector Office
Receiving Room
Tool and Die Shop



The east side is devoted practically entirely to the manufacture of the wings and tail surfaces. Ribs and spars are built up of aluminum alloy, assembled, painted for protection against corrosion, covered with fabric and finally doped and finished ready for assembling to the hull. In general, the scheme is to have the parts flow from either side to the assembly bay.

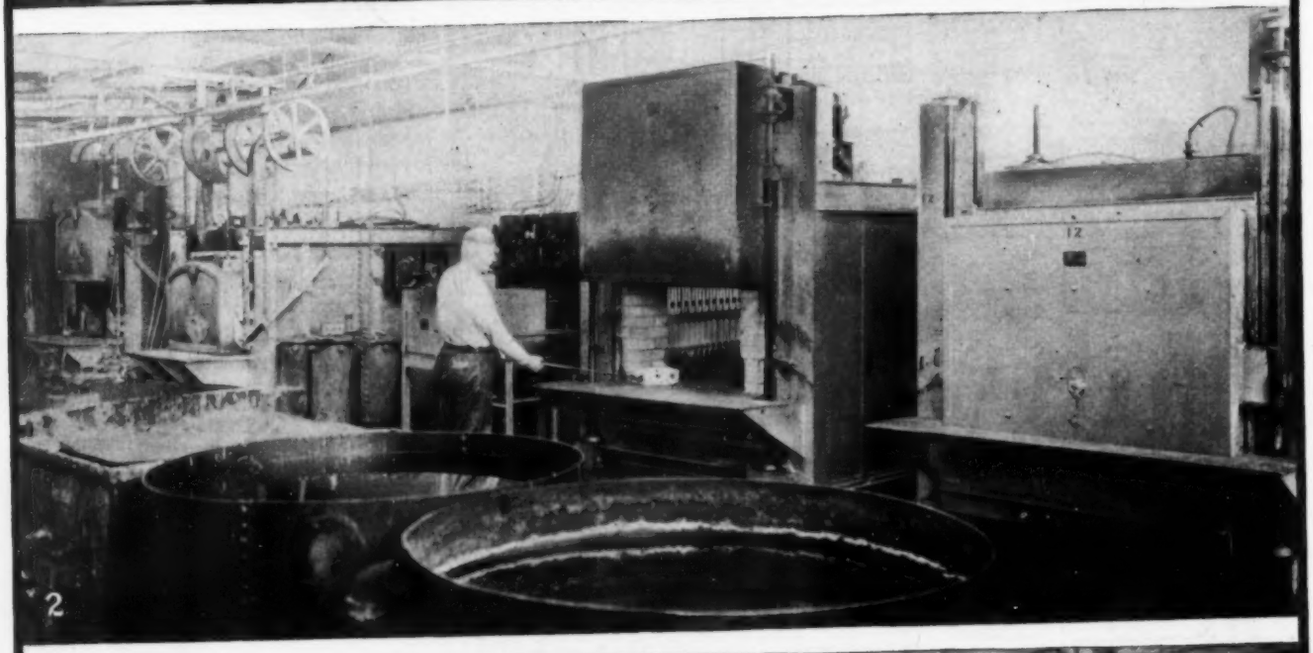
There is considerable work to be done on the engines before they are assembled to the airplane. This is done on a platform in the assembly bay the height of which brings the engines to about the right position for assembly to the motor mount on the airplane.

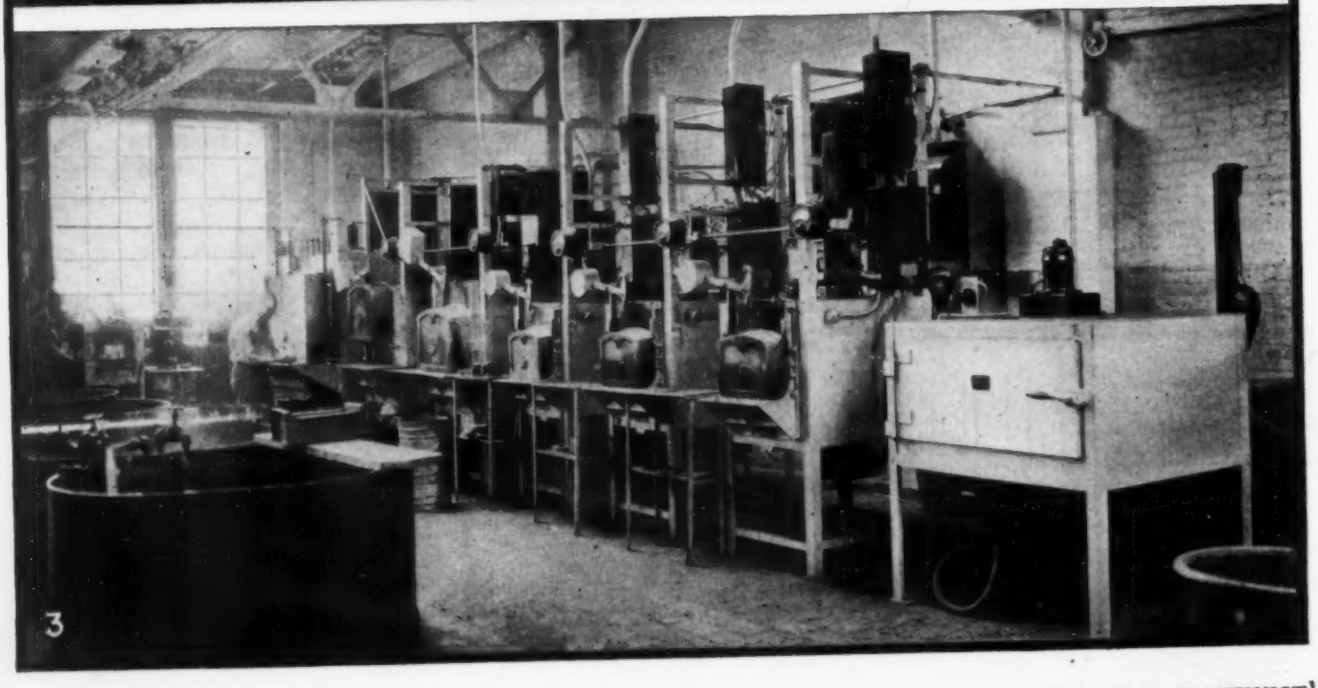
At the present time the Sikorsky Aviation Corporation is manufacturing planes which range from single-engined planes of 52-ft. wing spread to four-engined planes with 114-ft. wing spread. A greater range could hardly be possible in airplane construction. To handle so many projects of different specifications requires a rigid system of control, beginning with the design and following right through to the completion of the production job. Organization of the engineering is no less difficult or important than the manufacturing.

The statement has been made, and truthfully, that manufacturing airplanes is 90 per cent engineering. Here, again, a great difference is found in comparison with the automobile industry, in which production quantities are so large that all of the engineering is completed on a model before it is built in the shop. That is to say, the manufacturing of each and every part can be completely planned from the information furnished by the engineering department.

First of a series of two articles. The second and last will appear next week.

General layout of the manufacturing plant, showing the overlap of two orders going through the shop. An idea of the arrangement which permits maximum flexibility may be gained by even casual study of this plan





Tool Heat-Treating at Schenectady

R. H. MIGHELL
Industrial Heating Engineering Department
General Electric Company

SINCE 1914, all departments in the Schenectady plant have made use of a centrally located tool-heat-treating room. That same year also witnessed the first step in the use of electrical equipment. Two deliveries of work are made to the department each day with complete instructions. When finished, the material is inspected, tested for hardness if called for, and returned. Increased production, higher quality of work and reduction in handling labor have been effected by concentrating this work in one department.

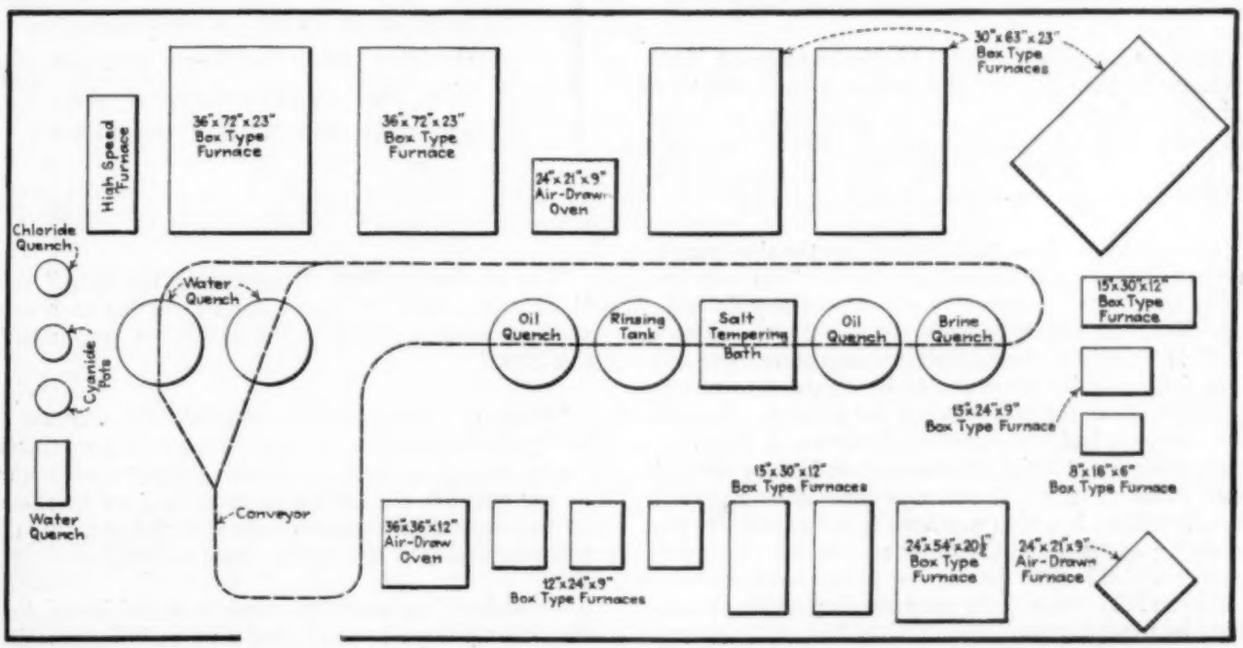
The layout below shows that the equipment in the tool heat-treating room is as follows: Fourteen box-type furnaces, three air-drawing ovens, one high-speed furnace, one salt tempering bath, two cyanide pots, one chloride quench, and a series of water, brine, and oil quench tanks situated conveniently to the furnaces. All equipment is electrified. Monorails and two electric hoists facilitate charging and unloading the furnaces and transporting the work.

Most of the equipment can be seen in Fig. 1, which is a view down through the room. Large batches or large parts are heat-treated in the three box-type furnaces shown in Fig. 2. These furnaces measure 30x63x23 in., and are rated at 60 kw. On the same side of the room are two 36x72x23-in. furnaces for carburizing and hardening high-carbon and chromium steels. Between these groups of furnaces is an air-drawing oven. A high-speed furnace is placed at the end.

On the opposite side of the room are several smaller box-type furnaces, as shown in Fig. 3. An air-drawing oven is placed at the left-hand end and next to it are three 11-kw., 12x24x9-in. box furnaces for hardening small batches of high-carbon steel tools. These furnaces operate at a maximum temperature of 1,850 deg. F. For the same type of work in larger sizes and quantities, two 15x30x12-in. furnaces are used. These are rated at 18½ kw., and handle a charge of 125 lb. per hr. at 1,500 deg. F. For still larger batches, a 24x50x20½-in. furnace, rated at 45 kw. is placed in the line-up. Beyond this is an air-drawing oven.

At the end of the room are three furnaces of graduated sizes. The small 8x16x6-in. furnace is rated at 5 kw. and is run continuously for emergency use with small tools, since the temperature can be varied quickly. At the other end of the room are two cyanide pots for hardening machine and cold-rolled steel, and at the same end is a chloride pot for quenching high-speed steels at elevated temperatures. Through the center of the room are arranged the oil, brine and water quenching tanks and a salt tempering bath for lower temperatures than those afforded by the air-drawing ovens.

Every furnace is equipped with automatic temperature control. Automatic time switches are provided with the larger furnaces to turn on the heat automatically in the morning before the men report for work, overcoming delay in getting out orders.



EXECUTIVE

Shirt Sleeves or White Collars?

Shop men frequently express concern at the mounting ratio of burden to direct labor costs. This has been regarded as a normal outgrowth of scientific management. Functional control has given rise to departments and activities unknown in the smaller manufacturing units of past years. In turning to these sidelights of manufacture, have we actually placed too much emphasis on the trimmings at the expense of the main job of getting out the product? Or have these auxiliary activities with their white-collared workers paid their way? What do you think?

THE HUM of busy machines still fascinated J. J. Masfield, President of the Masfield Foundry & Machine Company. During recent years, he had confined his business activities to the office, leaving the shop management to his lieutenants, but whenever possible, he made a morning tour through the plant. He still felt more at home trying to make himself heard above the noise of the shop than across his mahogany desk.

"I was going to ask you to come in and see me today," said Masfield meeting his works manager half way down the first machine bay.

"Want me to reduce production costs again?" guessed Thomas McMurray with a grin.

"Your getting to be a mind reader," Masfield acknowledged. "That's it exactly. We've been pretty lucky in keeping the shop busy when some of our neighbors have been barely limping along. But, if we are to continue at this pace, we must keep costs to a minimum. I'm aware that the shop is on an efficient basis now. But these are unusual times, and our salvation lies in unusual effort."

"You know that I've never dodged my share of responsibility." said McMurray, "but I feel that further cost reduction must be approached from another angle. Not many years ago, 95 per cent of our whole organization was engaged in production. Now the white collar brigade outnumbers the men in shirt sleeves."

"We've grown a good deal since those days," reminded Masfield, "and our problems are different."

"I'm allowing for that," said McMurray, "but in our anxiety to get the last bit of effort from the men at the machines, we've created entire departments to analyze, plan and check their output. Frankly, I believe we've gone too far."

"You can't deny that these auxiliary activities have contributed to our present standard of efficiency."

"They all have their merit," McMurray agreed, "but I wonder if they pay for themselves when carried to such a fine degree. We're cutting costs with one hand and piling them on with the other. I'd like to see what the time study department, the cost department, and some of the others could do to reduce expense."

"Picking on overhead has always been the shop man's favorite indoor sport," said Masfield. "No concern wishes to tolerate unnecessary expense of any description. But it should be remembered that the term 'overhead' is merely a bookkeeping designation, and all items falling under it are not to be regarded as necessary evils. Take the power house for example. Twenty years ago, we had low-priced equipment and plenty of direct labor for stoking, ash removal and heavy manual jobs. Now we have a few men to turn valves and read gages but there is a high overhead in automatic stokers, conveying systems and the other accessories of a modern plant. Still we're getting our power more cheaply. The same holds true of the machine shop although confused by more factors."

"I'm all for modern equipment in the shop," said McMurray. "But it doesn't seem right for each man working on production to be carrying a non-productive man."

"Many of your so-called non-productive men are in reality just as productive as the men at the machines. Designers and research men make a direct contribution to our product although they're classed as overhead. In a somewhat different way, the cost and planning departments do their share to increase output."

"Yes, but they seem to spend an awful lot of time thinking up ways to prove that they're indispensable."

FORUM

Discussions Of Former Subjects

Friendliness or Aloofness?

Friendliness pays dividends. Not only the cash return that to most of us is the definition of dividends, but returns in appreciation, cooperation, and square shooting. Friendliness is not familiarity. When the men know that the boss is for them, will give them every chance to make good, appreciate their efforts to improve the product or methods, then they will reciprocate to the fullest extent.

Friendliness is not forced, it is not artificial, but rather the kindly feeling that we have for our fellow men. Visiting the home when there is sickness or death means a lot to the man who is in trouble. Friendliness means that the men call the man higher up a regular fellow, one who passes out praise as well as criticism, one who gives them certain leeway but calls them quickly when they overstep their bounds.

The friendly executive holds the men when others are offering more money. When the time comes when every ounce of energy and loyalty is needed from the men, then that loyalty and energy is there.

—E. F. WERNER, *Superintendent, American Fixture and Showcase Manufacturing Company.*

It is highly commendable, in theory, that a president of a company should find time to interest himself in the personal affairs of his workmen away from the plant; but it is not desirable—nor does it make for efficiency. In a small organization, a major executive might find time to get into the affairs of all his employees. In a large organization, he could interest himself in the troubles of but a few. These few would promptly consider themselves favored above their fellows and act accordingly. Who is to tell them that this interest on the part of their employer does not mean that the employee from then on is indispensable to the plant or its being? The rest of the workmen look at the chosen few with jealousy and suspicion. The few get the habit of taking up small matters with the Big Boss, matters which should never go beyond their own foremen. The Big Boss, having listened once, eventually finds that he must listen to everything they have to say. Sooner or later, he realizes that he has unconsciously stirred up a particularly undesirable form of trouble.

Friendliness of spirit, a pleasant word, or a cheerful smile given impartially to all workmen in the plant, certainly. Interest in individual men away from the plant is favoritism or partiality. That interest of an executive had better be saved for his associates. They will understand its true value.

—JAMES K. MATTER.

Come Seven?

Our productive capacity, thanks to the technical progress of the last thirty years, has left our capacity for distribution far behind. The cost of distribution amounts to one-half the price of the commodity to the consumer. Of a total population of forty millions in England today, no less than two million men are connected with transport. A steady increase in the number of persons in the commercial or distributing class and in the class offering personal or professional services, together with a consequent decrease in the productive class, will partly compensate for further technical progress. Shorter hours all round seem the logical solution to the problem of absorbing surplus labor. Yet we need educating for leisure just as much, if not more, than we need educating for work. While everything points to a better appreciation of this fact, the average man at present neither wants, nor knows how to use further leisure hours.

—J. TRICKETT, *Lancashire, England.*

Promising Performance

There are guarantees and guarantees. And if the buyer wants one so unconditional and ironclad as to cover a one hundred per cent performance under any and all conditions, he is unreasonable. It is more sensible for the buyer to place an order for six lathes subject to acceptance after a test-run during which a predetermined number of valve bonnets shall have been turned out according to the print and schedule. Here is a guarantee to the effect that the machines will do all that the seller claims and the buyer accepts with the joker. "Everyday shop practice," left out because it is too slippery.

—O. VOGETZER.

Brain Fag

A rest period of from 5 to 10 minutes during the middle of the morning and afternoon with the windows wide open is a fine thing during the winter months. Usually a designer can plan his trips into the shop in such a way that his work will be expedited and his mental forces will be increased.

Good sanitary conditions such as fresh air, uniformly heated rooms and proper light should be provided. If any relief beyond that is necessary, it should not be obtained by strolling without permission. Concentration while working and avoidance of dissipation during the evenings prepare the mind and body for an honest day's effort. The proper consideration of his men by an executive has a tendency to rest the nerves and increase the daily output, whether it require mental or physical effort.

—H. O. OLSEN, *Chief Draftsman, Oliver Farm Equipment Company.*

Free Advice

I was at one time employed in a large plant where all employees contributed to an "Employees' General Fund." Contributions were very small,—only one-third per cent of the wages—and the firm made an equal contribution. This fund was administered by three representatives of the workers. In addition to providing such things as scholarships for employees and their children, it was used for assisting employees and their

families in special cases of need, particularly illness or legal difficulties. Medical specialists were persuaded to provide their services to members of the fund recommended by the committee at half fees, and legal advice was given by the firm's solicitor free of charge to recommended individuals. Advice on such questions as life, fire and endowment insurance, mortgages, holiday tours, and many other things were available freely from experts during an hour immediately following working hours once a week.

—H. J. BURNHAM.

Misguided Loyalty?

Clifton's personal loyalty to Craig is to be admired, but as Assistant Works Manager, Clifton is also responsible for any inefficiency in management. Some financial matter may be troubling Craig, who, to relieve his pent-up emotions, has told Clifton, rather than tell his superior. Home worries show up in our daily work and slow down our efficiency.

Wharton is acting with the very best intentions, and it is Clifton's duty to cooperate with him in straightening the matter out. It would help Craig and do the company a service in promoting better efficiency.

—W. F. ALLENBY.

Buy Design?

If the North Bend Railroad is denied detailed prints of the machines it purchased from the King Machinery Company, it should look elsewhere when placing future orders. Longman would like to protect his company so it might be sure to get all the repair parts business. Isn't it strange to see a manufacturer taking such a position, when in most cases, he is building machines which make parts for other machines.

Let me cite a few problems customers meet. A number of speed reducers were purchased from what was thought to be a reliable manufacturer, but in less than four years, he was not in existence, and the customer did not possess one detailed print. It is useless to go on, as the average experienced man can easily anticipate the rest of the story.

Another most interesting story is of an equipment that was giving considerable trouble. The customer insisted on a correction. The manufacturer complained that the customer was not operating the equipment properly, and after a time sent an expert to correct the trouble and to teach the correct method of operation. In less than one hour after the expert took charge of the machine, it was completely burned up causing considerable delay and expense to the customer. The customer complained very little, but machine No. 2 was identically the same. Finally the customer requested detailed blueprints so he might work with the machine intelligently, but these were denied. In less than six months, the customer had developed and installed a satisfactory means of correcting the trouble. The manufacturer then asked for detailed blueprints, showing the correction, and these were gladly given.

—E. T. DAVIS.

Cash or Check?

I prefer my pay by check because checks are safer to handle for the employee as well as the employer. They eliminate all question as to amount drawn, and do away with having cash in the house overnight.

The employee, by adjusting his habits and living conditions, can make the pay check an advantage over the cash pay. This may take a little planning as it requires a larger reserve due to semi-monthly pays coming in the middle of the week and the inability to cash the check until the following Saturday. This is really an advantage to the employee who operates under a budget, even in its simplest form.

—C. F. STAPLES.

Payment by check should be a great advantage to employers. This would apply more to America than to England. Here there is twopence duty on all checks and less likelihood of payroll robberies. A check could be made out to the exact amount due each man in much less time than it could be counted in cash. There would be less chance of error and no chance of dispute as to the amount received. From an employer's point of view, this method of payment should be ideal. Employees would not be inconvenienced if a meeting were called at which one of the heads explained the objects of check payments and dealt with any objections raised. The men should be encouraged to start a checking account and given any assistance. It is a wise policy to try to influence men's spending habits; the workers have the greatest spending power. If they spend wisely, the industry of the country will benefit.

—W. E. WARNER,
Herts, England.

Hours Gratis?

We believe the salaried worker should not expect extra money if he works overtime once in a while, as he is not docked when he is late or if he leaves early. He usually gets a vacation with pay. If it is necessary for the salaried worker to work an hour and a half overtime every night for an indefinite period, there should be some reward by increase in pay or special privilege. We find the salaried worker who is called upon to work overtime is usually the best in that department, and he has the highest salary.

—U. SETH EBERHARDT,
Works Manager, Newark Gear Cutting Machine Company.

Dismissal Wage

The payment of any sum of money to a workman leaving a company's service, while entirely commendable, is not a policy that can be followed by industry as a whole. Present conditions make it more obvious that some form of state industrial employment insurance is necessary to alleviate the distress which is a direct result of economic depression. A workable scheme could be originated whereby employer and employed would be co-partners in providing a reserve fund to be used in such emergencies—a scheme which would in no way resemble the dole, which is meeting such adverse criticism in Great Britain.

If it were possible to assure the unemployed workman of a sum approximating two-thirds of his weekly income, his buying power would react accordingly, and would certainly be a contributing factor to the return of normal conditions. In contrast to the Mexican scheme, the burden would not fall entirely on the employer and need not come under legislation.

—ROBERT S. ALEXANDER,
Universal Winding Company.

Recording Contour Gage

E. C. ERICKSON
Bell Telephone Laboratories, Inc.

A visual recording method of measuring the variation in a plane surface, either of itself alone or in its relation to adjacent planes

THE faithfulness with which a telephone transmitter converts sound into equivalent electrical waves depends to a large extent on the design and action of the diaphragm. Proper performance requires that it be both accurately constructed and so mounted that the voice vibrations are correctly transmitted to the mass of carbon granules where the conversion to electrical waves is accomplished. The diaphragm for the handset transmitter has three seating surfaces which are employed to position it accurately between the mouth of the cavity containing the carbon granules and the supporting frame. Irregularities of these surfaces in either parallelism, flatness, or in the separation of their planes, affects the operation of the transmitter. To determine how much variation might be allowed in these characteristics without appreciably affecting the quality of transmission, and thus to determine proper manufacturing tolerances, it was necessary, as part of the development work, to measure a large number of diaphragms very accurately, assemble them in handsets, and then compare the quality

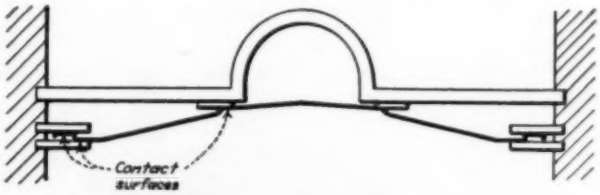


Fig. 1—Schematic diagram showing location and relation of the three bearing surfaces of a telephone diaphragm

of transmission with the variations in the diaphragms.

The handset diaphragm and its location in the transmitter are shown in the accompanying illustrations. The position of the three seating surfaces and their relative positions are indicated on the schematic diagram, Fig. 1. Measurements taken must determine variations in flatness and parallelism of these three surfaces, and also the distance between their planes. Punched from Duralumin sheets only three thousandths of an inch thick, the diaphragms are exceedingly delicate, and care must be taken so that the measuring device will not itself cause distortion.

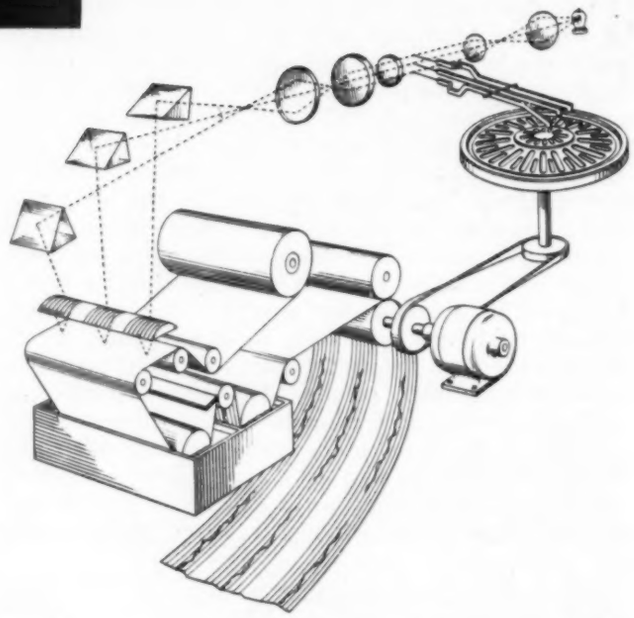
The variations were determined, where only a few samples were concerned, by taking point-by-point micrometer measurements around the diaphragm. A special measuring pointer with a very light pressure was employed. Not only was this method dependent on the personal equations of the tester, but the time required was considerable. Nearly a day was necessary to secure measurements on an adequate number of points around the three seating surfaces of a single diaphragm. For a man to measure the requisite number of diaphragms in this manner would have required a number of years so that it was necessary to develop a measuring device which, with the same or greater accuracy, would be capable of much more rapid measurements.

As finally perfected, the apparatus is shown photographically in Fig. 2, and diagrammatically in Fig. 3. The diaphragm rests on the rotating table of a small jig, shown in greater detail in Fig. 4. One end of each of three pivoted feelers rests on the diaphragm along a radial line. Two of them rest on two of the actual seating surfaces while the third rests on the back of the third surface. Since variations in thickness of the metal are very minor, no appreciable error was introduced by this arrangement. The other end of each feeler carries a wire a thousandth of an inch in diameter and the ends of the feelers are bent so that the three wires lie one above another in the focal plane of a light projector.

Shadows of the tips of the three wires are projected onto three prisms, each of which refracts the shadow of

Fig. 2—The completed apparatus as set up for use in a darkened room. The three prisms are shown on the inclined fixture on the upright rod. From these prisms the light is reflected down onto the sensitized strip within the case. The motor that drives the mechanism is shown at the extreme left

Fig. 3 — Diagrammatic sketch showing essential elements and light paths



one wire down through a cylindrical lens to a photographic recorder. The cylindrical lens is ruled with lines $\frac{1}{8}$ in. apart which form ordinate lines on a strip of photographic paper passed through the light field below the lens and then through developing and fixing baths. A belt attached to the recording mechanism also drives the table carrying the diaphragm.

As the diaphragm is rotated each of the feelers moves up or down as the surface deviates from a plane. The travel of the wire pointers on the ends of the feelers is recorded on the photographic tape and forms a permanent record of the variations in the diaphragm. The magnification of the vertical motion of the levers is exactly 125 so that $\frac{1}{8}$ in. on the paper—the spacing of the ruled lines—is equivalent to one thousandth of an inch on the diaphragm.

Two typical records are shown in Fig. 5. One shows a fairly good diaphragm and the other a poor one. From such curves considerable information may be obtained. The interplanar distance between any of the seating surfaces may be obtained in thousandths of an inch by a proper calibration of the chart.

In addition to these principal measurements, it is also possible to see the type of distortion existing in the diaphragm. One line fairly straight, for example, and another varying unevenly—with jagged breaks—shows that that particular surface is rough while the diaphragm as a whole is undistorted. A similar wavy characteristic of all three lines, on the other hand, indicates a warp of the diaphragm as a whole.

With this rapid method of measurement it was possible to obtain curves of 10,000 diaphragms in one week. An electrically operated mechanism was devised which on pressing a foot switch raised the three feelers so that a

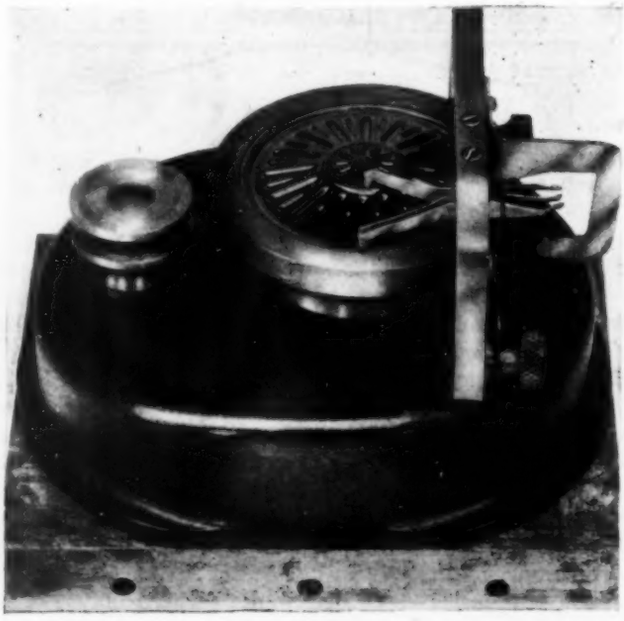


Fig. 4—The fixture in which the diaphragm is revolved and the three fingers. The right hand ends of the fingers carry the fine wires. The part at the left is the driving pulley

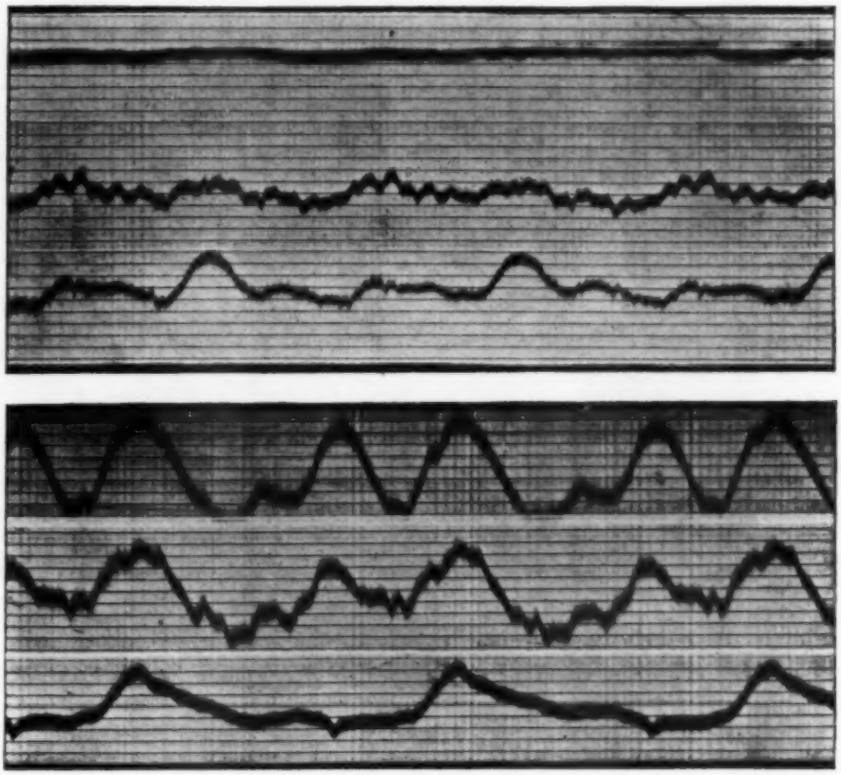


Fig. 5—Photographic records of a good and an unusable diaphragm. Each line represents 0.001 in. and illustrates how apparently identical pieces vary

new diaphragm could be inserted, and at the same time connected a resistance in the circuit of the driving motor to slow down its speed. This arrangement cut down the amount of photographic paper between successive diaphragm records.

Although this apparatus was developed primarily for measuring the ring seating surface of diaphragms of handset transmitters, it is rapidly finding other uses. It may be employed to measure distance of separation, flatness, and parallelism between all sorts of ring surfaces or for studying the accuracy of concentric bearings or shafts. Also it will serve to determine the contour of miscellaneous parts such as machine screws.

Why a Production Department—*Discussion*

C. L. HENRY
Nottingham, England

THE article by Chester B. Lord, "Why a Production Department" (*AM*—p. 419, Vol. 74) will undoubtedly raise a host of *American Machinist* students to express their opinions on this question. I, myself, a foreman of many years, have to register my complete approval of the truth of the statements in his remarks.

In my career of thiry years standing, I have seen the introduction of all kinds of supposed doctors to cure the supposed ills in the systems of production in our factories, only to find that the majority are nothing more than glorified policemen, checking and double checking the efforts of those in the shops who do the actual work and who often know more than these so-called experts.

True, there are only two simple operations in any manufacturing concern, so why have more than two executive heads to report to the manager, who can then know where to place the blame in case of trouble? The tremendous amount of overlapping and fighting-to-be-in-the-limelight of management has completely blotted out the two simple operations of production.

When one thinks of factories with a dozen highly paid officials with nice carpeted, arm-chaired suites of offices, with masses of paper work all around them, it makes one wonder how the product of the shops can pay for it all. True we do it, because we in the shops must continue to chase and flog a dollar's worth of work down to ten cents. Production costs in the shop must come down and they do, but the savings are swallowed up by "old man overhead." Yes! By all means cut out the production department; organize a planning department. Let the superintendent and his foreman plan and progress the work through the shop, because they are in contact with every phase of production from toolroom to finished goods.

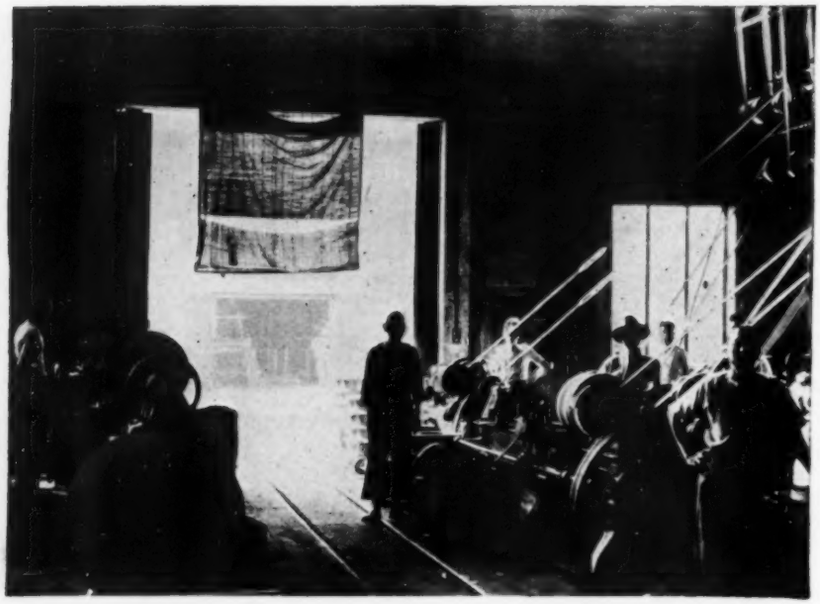
The majority of superintendents of the present day have been through the hard school of practical experience of production, and spend most of their leisure in studying the intricacy of modern business control. This, thanks to the technical press, can be swallowed weekly, straight off the press, and it fits men to "control and direct."

So, "Why a Production Department?"

Portable Shears

R. H. SOPER
Factory Manager, Browne-Morse Company

IT HAS BEEN our practice for a number of years to mount our shears (up to the larger capacities) on heavy steel ball-bearing casters, and to pile our sheet steel in tiers with openings between to permit passage of the shear. By placing a shear at right angles to the piles or swinging it around to face the opposite tiers, almost any combination for shearing can be acquired without difficulty. One man can move the shear with ease. Feeding is of course directly from the pile. This saves handling the sheets on trucks and carting them to the shear, since plug-in receptacles are mounted conveniently about 16 ft. apart on the storage floor. We have found this method very convenient.



While the location of the story is Malaya, the workers and supervisors, and usually the owner, are all Chinese. The natives serve only as laborers

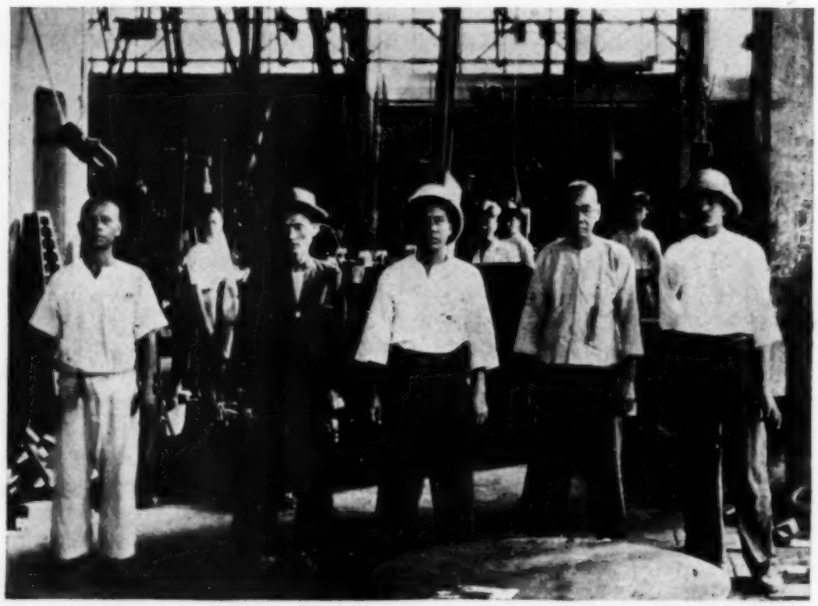
The Shops of Malaya

WALTER BUCHLER
London, England

THE majority of the hands employed in engineering works in Malaya are Chinese. The larger establishments are owned and run on more or less modern lines by Europeans, but the Europeans are in the minority, there being any number of small Chinese work-shops owned by one man who probably was once a foreman and obtained his experience at one of the large works in the country, or in China.

The average Chinese fitter, turner, or machine hand in engineering workshops is about 25 years of age. The method of teaching them their trade as followed in the larger shops is by employing them as apprentices at the age of 14 or 15. The apprentice works his way through the various steps of a mechanic's training until he acquires the necessary knowledge and becomes a journeyman. In the first year he generally assists journeymen fitters, during which time be becomes acquainted with hand tools and appliances and the methods of using them. The second year is spent in fitting and vise work, and the remaining three years are taken up with machine work. Commencing on a small drilling machine, the Chinese apprentice gradually works his way through the whole range of machine tools and pneumatic equipment used in the workshops. The five years' training gives him an opportunity to demonstrate his particular aptitude on any particular machine, with the result that on completion of his apprenticeship he may be employed as a turner, fitter, marker-off, general machine hand, or fitter and turner.

As turners, the Chinese are particularly adept, though their methods at arriving at changes of gearing for screw-cutting are purely rule of thumb. Nevertheless, if a particularly intricate change of gears is required and the information cannot be obtained from older workmen or from the foreman himself—also a Chinese—then he will come to the manager for advice and help. A turner in Malaya can always get a job, as there are many firms in the larger towns, such as Singapore, Penang, Kuala Lumpur, Ipoh, etc., using lathes, as compared with other machines having a more limited range of utility. Even small Chinese workshops are usually equipped with

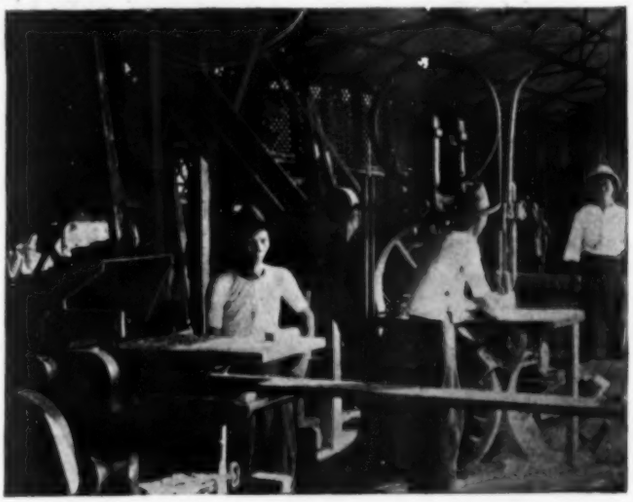


Foremen of a Singapore shop. Left to right, foundry, blacksmith, carpenter, machine shop heads, and the European superintendent

drilling machines and lathes but they have not sufficient work to warrant the installation of planing, milling, shaping, grinding or other machines. Work which is, as a rule, done by these more expensive machines, they will do with hand tools or by adapting the lathe to the job. A characteristic of the Chinese fitter is that he is particularly ingenious in devising methods and gadgets to attain this end. When he comes up against a piece of work which should be done by a planing machine, he uses his wits to do the job on the limited machine tools at his disposal. The Chinese make the most of whatever machinery and machine tools they may possess. The Chinese turner is trained in much the same way, as a machine shop artisan. As artisans these men compare favorably with Western workers, but are somewhat slower and as well as being inaccurate compared to their contemporaries in America or England. For instance, a Chinese turner will file a bushing at one end with the view to making it easier to drive home, not realizing that the bush should have a bearing the whole way into its housing. This he does not do because it means less work for him, but because, from his point of view, it facilitates driving the bush into place.

Chinese plate workers are trained in Malaya by working steel plates and angles under the same apprenticeship methods as the machine shop uses. These boilermakers compare favorably with their counterparts in Western countries, with the exception that their work is inclined to be inaccurate unless carefully supervised by an efficient foreman. The average Chinese boilermaker is not, as a rule, good at marking off his own work. On the whole, however, he is quite good and if one has a good plate worker, he will finish off a piece of work, as, for instance, a tank, in full alignment and with all holes fair. Chinese boilermakers in Malaya are trained also as riveters, with the result that, having completed the erection of a tank, the same boilermakers proceed to rivet and caulk it, getting accuracy and tightness at the joints and rivets. The same remarks as to good work apply to Chinese angle-smiths and the remaining plateworkers.

Chinese coppersmiths are the highest paid local artisans. The success of their work depends entirely on their manual ability. They are exceptionally able craftsmen and good pupils. The Chinese are apt, however, to have peculiar conceptions of how a piece of work should be done, that is, if they have not done any work of that kind before. If allowed to go their own way, it is not improbable that they will turn out work which is crude and frequently quite unsuitable. A Chinese coppersmith will earn from 30 to 40 cents an hour—Straits Currency—or even more, depending on his value to the firm. If he is good at repairing radiators of motor cars, he will get more in an automobile firm, which must depend on his abilities in order to undertake such repair



Carpenters are the most intelligent and highly paid of all Malayan workmen. They excel in work that is characteristically Chinese, but not in the Western type of work

work at all. In addition to being a coppersmith, the Chinese is usually very good at bending and jointing steam pipes, whether of iron, copper, welded, or seamless drawn steel, and as the whole his work is both quick and good. As not much coppersmith work is done in one place, there are not many coppersmiths in Malaya, and a good man is worth good pay.

Chinese molder pupils work on the same basis as other apprentices. During the apprenticeship, his time is spent partly as a molder and partly as a core maker on iron and non-ferrous work. Sand blending and mixing is done under the foreman's supervision as directed by the management, but all molders are trained to acquire the necessary knowledge of all sands suitable for iron and brass. Their training as molders embraces green sand, dry sand, and loam work. The result of this comprehensive training is such that molders become inter-

The molder in Malaya is the most fortunate of workmen because he squats at his work. This position is restful and natural to him. The men with turbans on their heads are natives who do the helping and the heavy lifting

changeable. For instance, a man working on loam one week may be engaged on dry sand molds the next. The following week he may be put on green sand or machine-molded work. If during the course of his apprenticeship an apprentice-molder shows particular aptitude at any individual process, he may elect to specialize in that particular section. For example, a boy who is clever at core making may be employed continually at making cores as a journeyman. A journeyman core maker of this type is particularly useful in a workshop for making intricate cores, such as for steam cylinders, impellers, and other complicated cores. On the other hand, an apprentice may become a very good furnace hand with the result that he might be placed in charge of cupola charging and tapping.

A molder in England works in the sand in a kneeling position, and cases of rheumatism are frequent through kneeling continuously in damp sand. The Chinese worker, however, naturally squats at his work, a position ideal for this kind of work. The Westerner, if he attempted to follow the Chinese in this, would find the position very awkward and tiring, but the Chinese are used to it from childhood.

There are a good many small Chinese foundries where the melting of iron—usually scrap-iron—is carried out by rule-of-thumb methods, and it is doubtful, were one to ask for a casting made to any specified analysis, whether it could be undertaken.

The majority of the carpenters engaged on any kind of carpentry work, whether in workshops or furniture-

Clerical work is the most desirable of all work in Malaya. To educate a son as draughtsman or clerk is the ambition of the better-class workman

making establishments, are Chinese, and they are really very skilled men. For shop work the Chinese carpenter obtains the necessary experience either in the shop itself during an apprenticeship of five years, or as helper to another Chinese. He will start work at the age of 14 and receive but a nominal wage during the years of his apprenticeship; with the Chinese he will probably receive no pay at all except his food and keep and a little pocket money on special occasions. The first year he works as helper to a journeyman carpenter, and in the course of time becomes a journeyman carpenter himself, receiving 25 cents an hour or more, according to his skill and the nature of his work. In the end, he is able to turn out any kind of carpentry work, including furniture, though the latter is of a crude kind. The Chinese carpenter is slower than the Westerner, this being probably due to the nature of the climate, which is both hot and damp, and partly to the natural temperament of the Chinese in never allowing themselves to be hustled in anything. The work of the Chinese carpenter is good, but it lacks the finish that is to be seen in work turned out by carpenters in America or England. He has not the experience to draw on that the man in the West has. He is unexcelled in the construction of junks and work typically Chinese, but is not so good on Western forms of work, as he is not familiar with Western methods. You have to explain every particular new item of work he has not done before. He is slow to follow ideas, but once he has grasped them, they remain with him forever. The Chinese carpenter supplies his own tools and still uses a bowdrill instead of the brace and bit. He has an old-fashioned frame saw, the woodwork having been made by himself. These tools are well made and last for a long time. The Chinese is very adept in the use of his feet and frequently holds work with his toes.

The majority of these craftsmen are married men and are of a higher social status and intelligence than the ordinary worker. They are sufficiently intelligent to realize that in the administration of a workshop in Malaya a clerk has a better job than a carpenter. Laboring under this conviction, they try to educate their sons to become clerks, for which position it is necessary that they learn English and accounting. That is the ambition of the majority of Chinese carpenters today as far as their sons are concerned. If carpenters are employed on outside work—i.e. to build houses—a temporary dwelling place is erected, the ground floor of which is used as a workshop and the upper floor for sleeping accommodations.

Carpenters in Malaya are inclined to prefer Government or Municipal jobs to others, as they are generally permanent positions and not as casual as individual jobs often turn out to be. Chinese carpenters have no unions, in the Western sense of the word, but they have societies and are more or less well organized when it comes to a strike. Their methods, however, differ from the Western. When a strike is decided upon, for example, in a city like Singapore, the territory will be divided into three sections. One section will go on strike and the other two support the men on strike. As soon as the demands of the latter are met and work resumed, another section will go on strike and receive the same support from the others. When that trouble is settled, the third section goes on strike and the same thing happens over again.

The blacksmiths employed in shops in Malaya are Chinese, but the hammer-men are Tamils (Indians). They work more cheaply. The former receive about 25 cents an hour, the latter about 12 cents. The blacksmiths do all sorts of forging and smith work. Every village has a blacksmith, usually a Chinese, with a small shop in which he has made for himself a forge out of bricks. This forge is blown by a bellows worked by hand by a laborer. The latter when not occupied in blowing, acts as a hammer man. The blacksmith in a town or village will do any repair work that comes to him, whether hand-carts, bullock carts, motor cars, or the nondescript collection of smith work such as is required in towns and villages. Materials he requires for his work he usually buys second-hand at junk sales. His work is generally good, but it seldom is anything very big.

HARRY SHAW
Tool and Gear Consultant,
Heywood, England

Multipoint Gages

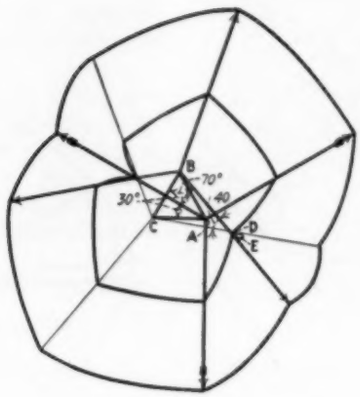


Fig. 12

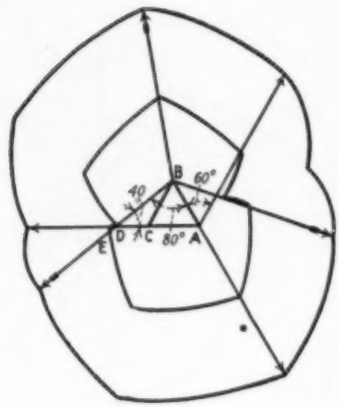


Fig. 13

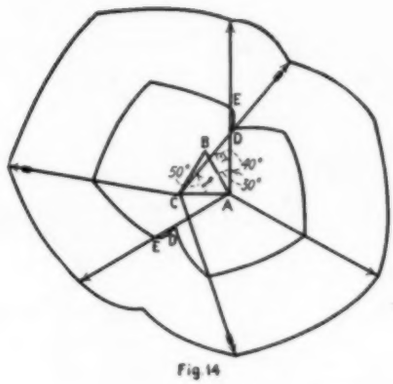


Fig. 14

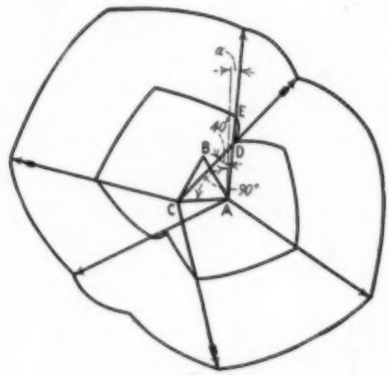


Fig. 15

Figs. 12, 13, 14, 15—The initial position of the gage arms in relation to the triangular path of the center controls the limiting length of arm

THE first article demonstrated that non-circular shapes could be generated by an equal three-point gage provided that its center moved along a path, called the centrode, during rotation. It was further proven that to form a closed figure the center must move completely around a closed centrode at least once while making one-third of a turn.

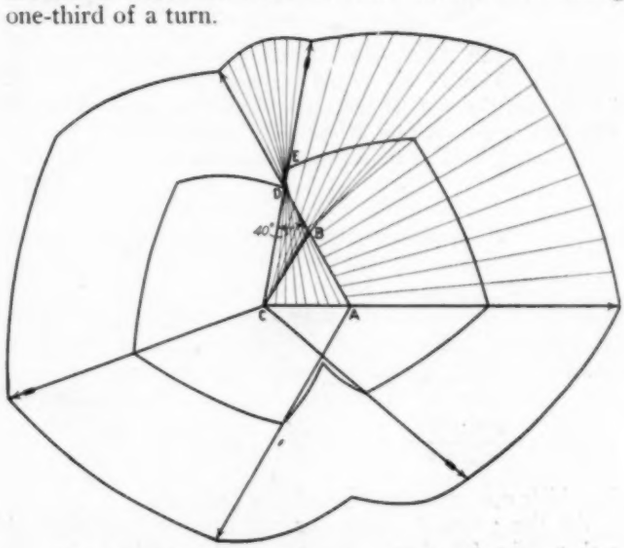


Fig. 11—When the center of a symmetrical three point gage follows an equilateral triangle and the gage is rotated simultaneously, this figure is produced

At that time, only straight-line centrodes were considered, but many other centrodes may be used. For example, Figs. 11 to 15 were constructed by turning a three-point gage while moving its center around an equilateral triangle. The centrode triangles were divided into 24 equal divisions and each arm of the gage turned 5 deg. for each division. In Fig. 11, the arm of the gage lies along the side of the triangle along which the center first moves, when the gage center is at the corner of the triangle; in Fig. 12, one arm lies 30 deg. to two sides of the centrode; in Fig. 13 one arm lies 60 deg. to the side of the triangle along which the center first moves; in Fig. 14, one arm lies 30 deg. to one side of the centrode; and in Fig. 15, one arm is at any angle to a side of the centrode.

An examination of Fig. 11 will show that the limiting length of arm is *AD*, for if the arm were any shorter, the in-projecting part at *D* would cross the arm *CE* when the gage center lay at *C*. Figs. 12, 13, 14, and 15 reveal that in every case, the limiting length of the arm is equal to the longest side of a triangle, one angle of which is 40 deg. This angle equals the number of divisions on the line opposite it multiplied by the number of degrees turned by the gage for each division. The angle opposite the longest side is 80, 70, 80, 90, and $(90 \pm \alpha)$ deg. respectively for the figures shown where α is any angle.

Finding the length of the longest side by the sine formula:

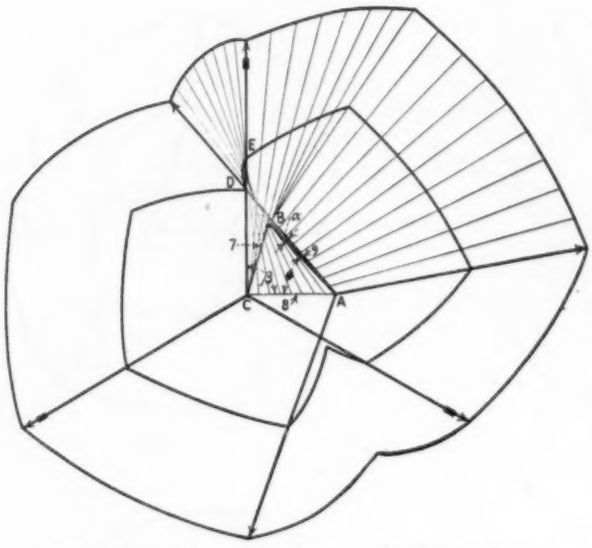


Fig. 16—A scalene triangle may also be used as a centrode for the three-point gage

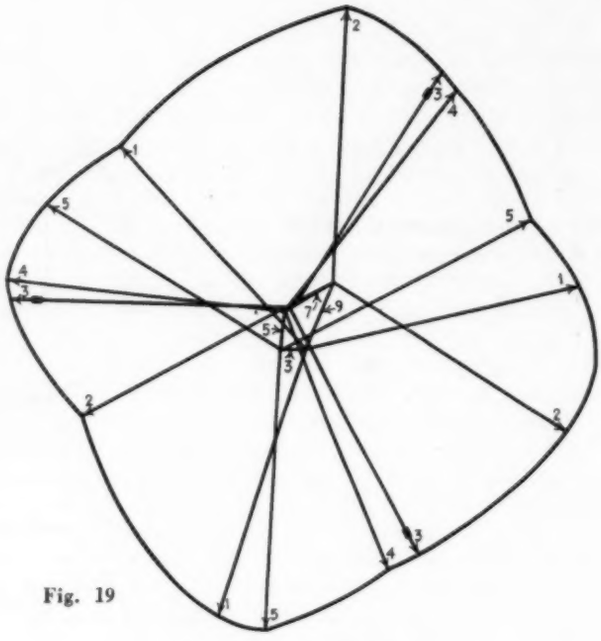


Fig. 19

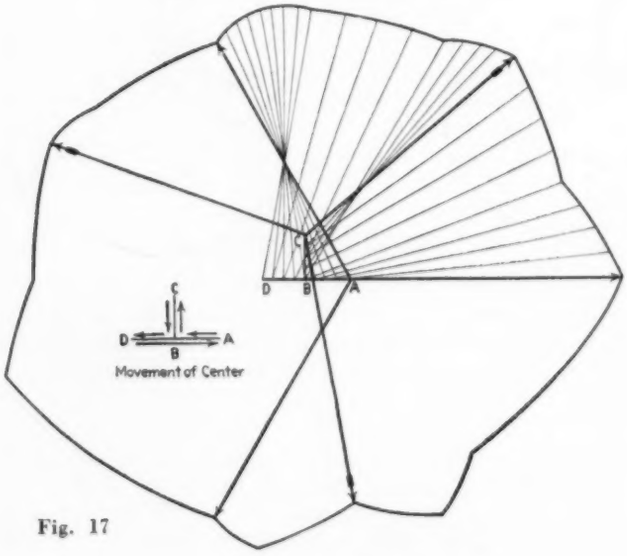


Fig. 17

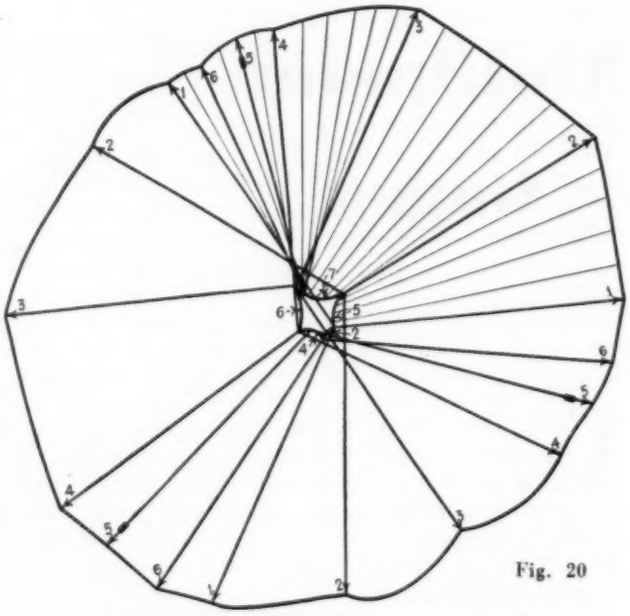


Fig. 20

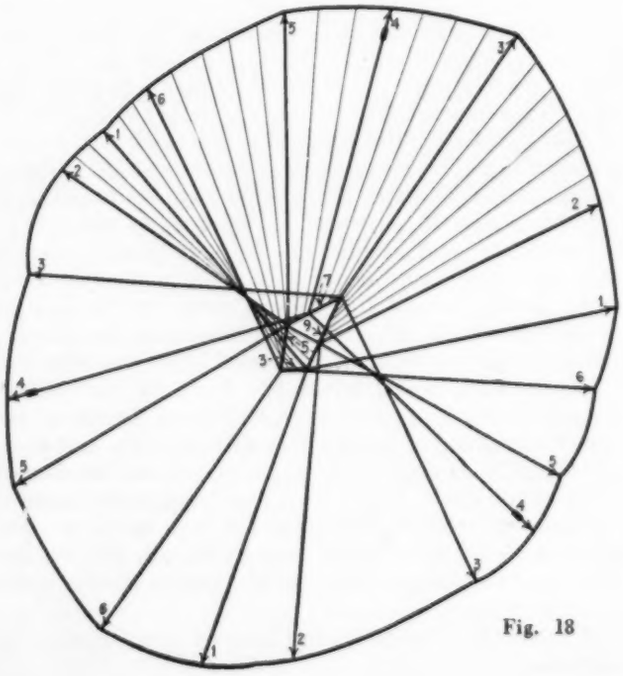


Fig. 18

Figs. 17, 18, 19, 20—Irregular shapes may serve as centrodes. Figs. 18 and 19 use the same centrode, but in one, the path of the center is in the same direction as the rotation of the gage, while in the other, it is in the opposite direction

$$\frac{a \sin 80°}{\sin 40°} = 1.5309\,a \quad \text{for Fig. 11}$$

$$\frac{a \sin 70°}{\sin 40°} = 1.4619\,a \quad \text{for Fig. 12}$$

$$\frac{a \sin 80°}{\sin 40°} = 1.5309\,a \quad \text{for Fig. 13}$$

$$\frac{a \sin 90°}{\sin 40°} = 1.5557\,a \quad \text{for Fig. 14}$$

in which a equals one side of the centrode.

As the greatest value for the sine of any angle is unity (sin 90 deg.), the conditions which give the greatest value to the limiting length of arm are those shown in Fig. 14. The smallest value of a is shown in

Fig. 12. When the arms are in odd angular positions as in Fig. 15, the case may be considered a variation of any one of the others.

When the sides of the triangle are not equal but are in the proportion $a : b : c$, it will be convenient to make $(a + b + c)$ divisions around the centrode giving a 120-deg. divided by $(a + b + c)$ turn for each division. In Fig. 16, the sides of the triangle ABC are in the proportions 9:7:8 so the turn for each division is 120 deg. divided by 24 or 5 deg.

Reasoning as before, it will be found that the limiting length of arm $AD = \frac{CA \sin B.}{\sin 40°}$ The limits for the minimum length of arms for shapes constructed using a centrode of several lines may be similarly calculated.

Figs. 17 to 20 show shapes constructed by turning an equal three-point gage through 120 deg. while moving its center along irregular, multisided centrodes. The relative sizes of the sides of the centrodes are shown on the illustrations, and the gages are shown in one or two positions by arrow ended lines. Figs. 18 and 19 are constructed with centrodes exactly alike, but the gage is rotated in a counterclockwise direction in Fig. 18 and in a clockwise direction in Fig. 19. The results of the two motions are quite different. It will be noticed that the more sides in the centrode and the smaller it is in relation to an arm of the gage, the more nearly the figure approaches a circle.

The shapes in Fig. 21 have been struck out by the ends of the arms of three-point gages of various sizes, their centers making one complete circuit of the circular path in a counterclockwise direction while the gages turn 120 deg. in the same direction. The shapes in Fig. 22 have been constructed by clockwise motion of the gage while the center moves round a circle in the opposite direction. From both Fig. 21 and 22, it will be seen that when the length of the arm of the gage is less than BA a loop is formed, so that a gage could not fit in the shape without interference. It can be proven that the smallest length of arm which will not form a loop is three times the radius of the centrode. But there is another factor that limits arm length.

Consider the gage that has points E, F, and G (Fig. 22) to have its center at C, 45 deg. from B on the centrode. Now, if the center C is moved along the dotted line CD, a continuation of the line EC that joins the point E of the gage to the center C the point E will move along the line EC while the points G and F will move along the dotted lines GH and FJ, parallel to EC.

But it will be noticed that the lines GH and FJ come within the contour of the figure in which the gage is supposed to fit. Therefore the gage can be moved laterally in the figure, and its two points F and G will cease to touch the contour. However, when the arm of the gage is longer than CF by a certain amount, say FL, lines LM drawn from the gage points and parallel to CE come without the contour. Therefore the gage cannot then be moved laterally in the figure.

The lines GH, FJ, and LM are at an angle of 60 deg. to the gage arms so if the gage is not to be movable laterally, the curve at LM must be at an angle of more than 60 deg. with the gage arm. The limit will be when the curve is at 60 deg. with the gage arm. When solved mathematically, this limiting arm length is found to be six times the centrode radius. So, if a gage has

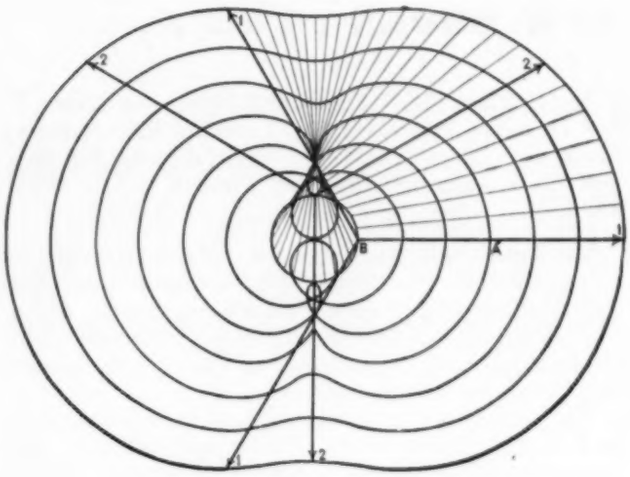


Fig. 21

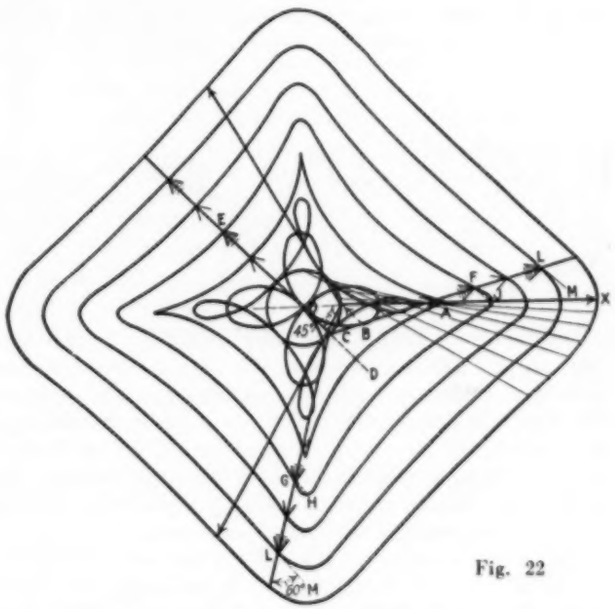


Fig. 22

Figs. 21 and 22—These shapes show the difference in figures produced with a circular centrode when the gage rotation and path of the center have a like direction and when they are opposite

to fit in the shape produced by its rotation while its center moves round a circular centrode in a retrograde direction, and not be movable laterally so that its points leave the contour, then the arm of the gage must be six or more times the length of the radius of the circular centrode.

No matter what position the arm of the gage may have before it starts turning, the figure traced out will be the same as those shown in Figs. 21 and 22, the only difference being that the arm starts tracing out a different part of the curve. It will have been noticed that the curves produced with a circular centrode are more regular and symmetrical than those produced with other centrodes, and perchance the curves appear familiar to some readers who have studied cycloids, epicycloids, and hypocycloids—all curves belonging to the trochoid family.

This is the second article of a series. The third and last will appear next week.

NEW BOOKS . . . . . .

ORGANIZATION ENGINEERING—*by Henry S. Dennison, president of the Dennison Manufacturing Company. 204 pages 5x7 in. Published by McGraw-Hill Book Company, Inc., 370 Seventh Avenue, New York, N. Y. Price $3.50.*

Mr. Dennison is a manufacturer. His business and its management are a monument to his ability as a manager, and they are quoted widely among engineers. Therefore, if anyone is qualified to lay down rules and record the reactions of both executives and men to those rules, it is the author of this book.

The book is not intended as an aid to industrial engineers in installing methods, it is suggestive rather than comprehensive, and some might say, a little too philosophic. This latter impression, however, is caused by the fact that the author is a keen analyst and by the further fact that human engineering plays a large part in his conception of organization engineering.

RESTRICTION OF OUTPUT AMONG UNORGANIZED WORKERS—*by Stanley B. Matthewson, executive director, Chamber of Commerce, Springfield, Ohio. 212 pages 5½x8½ in. Clothboard covers. Published by the Viking Press Inc., 18 East 48th St., New York, N. Y. Price $3.00.*

This book is divided into four sections. In the first part Mr. Matthewson presents evidence of restriction of output gathered during his experience as a journeyman in many shops, and the comments upon the evidence by those in authority. In the next section W. M. Leiserson, Professor of Economics, at Antioch College, describes the economics of restriction and their relation to the cases presented by Mr. Matthewson.

The next section is headed, "What can Employers do about it?" and is by Henry S. Dennison, President of the Dennison Manufacturing Company. In the final section, Arthur E. Morgan, President of Antioch draws conclusions from the preceding statements.

This book and the evidences of restriction it contains will be a revelation to shop executives, whether they think they know all the tricks, or whether they are the type that will readily admit that such practices can happen elsewhere than in their own particular shop.

Six reasons for output restriction are given; pressure by workers, boss ordered, wage payment, time study, fear of unemployment and personal grievance.

While every superintendent and foreman knows that men slow up when time studies are being taken, the general opinion is that this is discounted by the methods of the time-study department. The evidence presented seems to indicate that regardless of the efficiency of the shop, regardless of time-study methods and moving belts, output is restricted to an average of 50 per cent of what a man should produce under an incentive system.

The evidence is not hearsay, it represents the experience of 350 men with whom the author worked. Sixty-five executives were invited to comment upon the testimony, and some of the comments are amusing, in the light of evidence from the commentor's own plant.

The report covers practically every trade, and the evidence cannot be passed off with the comment that the practice is exceptional and not general.

Several things stand out sharply. The most significant is that men object to any system of computing bonus or pay where the amount earned is not always apparent to the worker, again, that there are literally hundreds of ways in which time study can be discounted, and finally, that under no circumstances should a price be cut. The saving on a hundred cuts will not compensate for the restriction the practice causes.

The impression the book leaves is that in most shops time study and incentive methods could be eliminated with advantage.

STANDARDS YEAR BOOK 1931—*Compiled by the National Bureau of Standards. 390 pages 5¾x9 in. Indexed. Bound in cloth boards. Published by the U. S. Government Printing Office, Washington, D. C. Price $1.00.*

The year book is in effect a progress report of various bodies engaged in establishing standards, governmental and otherwise. It makes no attempt to reprint any of the standards but confines itself to an outline of the fields in which the standardizing agencies are working. Considerable space is devoted to standardization progress and programs in the field of transportation.

The book is submitted as a "panoramic view of the value of research as an aid to standardization." But it is probable that most users will admit this premise and turn to the index at the back of the volume. Here may be found a list of commodities, manufactured products, and industrial activities with reference to those agencies drawing up standards for the fields in question.

ELEMENTS OF THERMODYNAMICS (WITH SPECIAL REFERENCE TO APPLICATIONS IN ENGINEERING)—*By Ernest M. Fernald, assistant professor of mechanical engineering, Lafayette College. 329 pages, 6x9 in. Indexed. Illustrated. Clothboard covers. Published by the McGraw-Hill Book Company, Inc., 370 Seventh Ave., New York, N. Y. Price $3.50.*

This text is planned principally to impart an adequate and flexible technique for quantitative dealing with a variety of complex situations. Clear ideas of the limitations of engineering practice by universal laws are offered, and conditions that must be met before current practice can approach the ultimate are outlined. Properties, processes and cycles of steam are treated fully, more than 23 pages being devoted to steam flow. Much is said concerning available energy, an endeavor on the part of the author to make this topic more concrete and better understood than it seems usually to be. Generalizations concerning available energy and the Second Law are placed late in the book, the students thus being led up to the Second Law instead of being led down from it.

The volume is concise and well illustrated, and is handled from a practical, rather than an entirely theoretical, viewpoint. No really new conclusions are advanced, but several old ones are given new support. Each chapter concludes with problems, 200 review problems and answers concluding the test.

Sharpening Reamers

L. M. RICHARDS

A familiar job, performed in a certain different way, gives some remarkable results

THE reamer has been used for many years to size or finish holes. A great many designs have been developed, many with the idea of improving performance or eliminating difficulties of one kind or another. The first type of reamer used was solid, that is, no adjustments whatever were provided. The life of this type was and is short because with each resharpening the size of the hole produced is reduced. The first reamers were made of high-carbon tool steel, and after resharpening, could be made to cut slightly larger by burnishing with a round nosed, blunt, hand-burnishing tool, rubbed along the throat of the blade with considerable hand pressure. This action tended to iron or roll back the metal, thus slightly increasing the size. Only a few holes could be produced, however, before reduction in size would again occur.

After the discovery of high-speed steel, this was widely used for reamers, and for many purposes, it produced tools with much longer life. High-speed steel properly hardened does not permit as smooth a cutting edge as tool steel, so that for work where an extremely high finish is required, the carbon steel reamer is still used.

In the automotive industry, where the production of holes runs into thousands daily, and where a highly polished finish as well as accurate sizes is demanded, it has proved economical to ream within a few thousandths of the desired size and then finish the holes with grinding. Some add a honing operation. For this class of production, it is not necessary to give too much attention to the quality of finish made by the reamer, but it is desirable to maintain sizes within reasonable limits, because each additional 0.001 in. left for grinding adds just that much to the expense of the grinding operation. It has been predicted that tungsten-carbide reamers will come into fairly general use and eliminate the necessity of finish grinding or honing.

Many types of adjustable reamers have been designed, some with the idea of controlling the size of hole produced and others with the idea of adding life to the tool so it would stand many resharpenings without the loss of size. No less than 90 per cent of difficulties encountered in reaming are caused by the methods employed in sharpening the tool. The usual procedure is to circular grind it to the desired size on a cylindrical grinding machine, after which, the lands back of the cutting edges are backed off uniformly to within varying distances of the cutting edge, usually from $\frac{1}{32}$ to $\frac{1}{64}$ in. To produce a smooth hole, it is necessary after backing off to hone the remaining land to a sharp cutting edge. This operation entails the services of a highly skilled mechanic and requires considerable time. The number of holes that can be produced after sharpening in this manner is quite uncertain and is governed somewhat by the method of final honing. Often the hone will be allowed to slide across the cutting edge and thus dull the particular point with which it comes in contact, causing the reamer to tear with a resulting poor finish. It also occasionally happens in honing that too much of the land is removed. If this is done, there is presented to the work a cutting edge not properly backed up, which causes this edge to break down prematurely and necessitates resharpening.

The backing off and honing operations are necessary because during the cylindrical grinding operation, no matter how carefully the process is performed, as the grinding wheel passes over the cutting edge it has a tendency to round it, producing a diameter across two opposite cutting edges that is slightly smaller than the remaining part of the land.

The writer recently discovered a method of sharpening reamers that removes the uncertainty of sizing, increases the life between grinds or sharpenings at least tenfold, and insures in addition a better and more uniform finish. These results are accomplished by circular grinding in the usual manner, then backing off the land to within 0.006 to 0.010 in. After backing off, the reamer is placed between centers in an ordinary engine lathe, revolved backward, and the lands lapped to a cutting edge. It is advisable to circular grind about 0.001 in. over the desired size, allowing no more than this for lapping. The lapping is done with a ring made of cast iron, smooth-bored 0.003 or 0.004 in. over the desired finished size of the reamer, and about 2 in. in length. For a lapping compound, a fine grade of valve grinding compound will prove very satisfactory.

It is important to note that this lapping operation requires only a minute or two, inasmuch as excellent results are obtained in a few revolutions. It is obvious of course that this method does not require the same skill as the old method, and at the same time, produces a keen cutting edge adequately backed up and a land that will not drag or pick up material from the work. Of course, it is necessary to break the corners of the cutting edges on the leading ends.

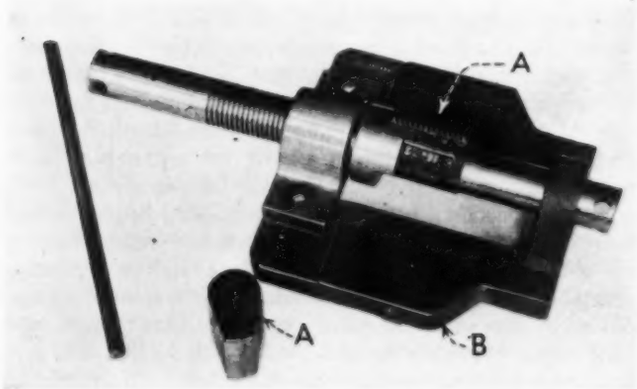
In one instance considerable difficulty was encountered in hand reaming a $1\frac{7}{8}$-in. diameter hole in heat-treated steel. It was impossible to sharpen a reamer that would produce the smoothness desired in the hole until one was sharpened by the lapping method. The first job on which the writer used this method was on a $3\frac{1}{2}$-in. cast-iron cylinder about $9\frac{1}{2}$ in. long in which it was impossible to produce satisfactory holes in more than 40 pieces with one grinding. With the new method, the average per grind was 250 cylinders and occasionally 600 to 700 holes were produced with one grinding, so that the statement of life increased by ten times is very modest.

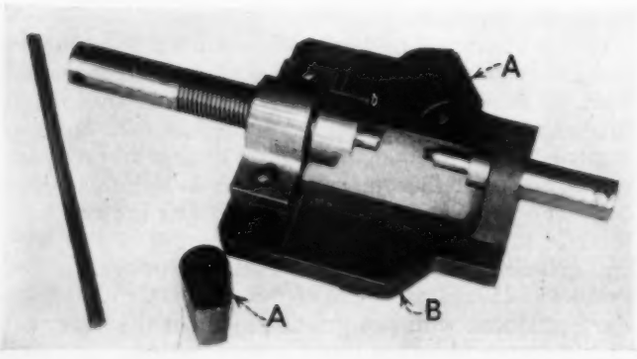
Ideas from PRACTICAL MEN

An Unusual Threading Job

AVERY E. GRANVILLE

It isn't often that one gets the job of threading pieces like the one shown at *A* in both Figs. 1 and 2. We had to make several hundred of these pieces, and made the fixture *B* for the threading operation. The fixture consists of a base; a lead screw of the same pitch as the thread to be cut on the work; and a tail piece threaded on its inner end to fit a tapped hole in the end of the lead screw. The lead screw carries a driver for rotating the work, and its inner end serves as a locating pin. In Fig. 2 the parts of the fixture are clearly shown, the work having been removed. Like letters in both illustrations denote the same parts.





With the fixture mounted on the table of the milling machine, so that the lead screw is in the correct helix angle in relation to the spindle, the work is placed on the inner end of the lead screw, being rotatably held thereto by the driver, and is clamped by screwing the tail piece into the inner end of the lead screw.

In operation, the lead screw and the work are revolved by a tommy bar, the work being under a cutter on the arbor. Fifteen revolutions are required to complete the thread, the tail piece being revolved and advanced in its bearing in unison with the lead screw. By placing the work when the lead screw has been backed until the driver contacts with the inner part of the fixture, the start of the thread will be the same on all pieces. Thus all pieces will be interchangeable (in so far as the starts of the threads are concerned) in the mechanism in which they are used.

Removing a Jammed Setscrew
Discussion

J. T. TOWLSON
London, England

In furtherance of the discussion of the article under the title given above (*AM*—Vol. 74, page 589), B. Hallman asks why I did not use an oxyacetylene torch, an electric arc, or a charcoal fire to release the hammer head from the piston. I did not use any of the means he mentions because their particular effectiveness did not at all appeal to my practical mind. The reason why I did use half a ton of molten iron was because that was the very means calculated to heat the head all over in a few seconds, causing it to expand away from the rod without heating it and causing it also to expand.

I do not believe that Mr. Hallman has grasped the fact that the head of the hammer was 12x12x12 in. and weighed about 450 lb.—and he speaks of expanding that lump of iron by a torch, which of all things is a strictly local means of heating. The same may be said of the electric arc. The charcoal fire goes to just the other extreme and would heat the hammer head too slowly, expanding the piston rod at the same time and leaving things as they were—the head tight on the rod.

Mr. Hallman, as well as interested readers, should know that the essential thing on such a job is the quickest possible heating of the bulk to be removed. Since this condition rules out all such local heating means as he suggests, what better means were available than half a ton of molten iron carried from a cupola in action, and just a few yards away? It did the trick in quick time and at little cost, and the writer went "one up" on the incident.

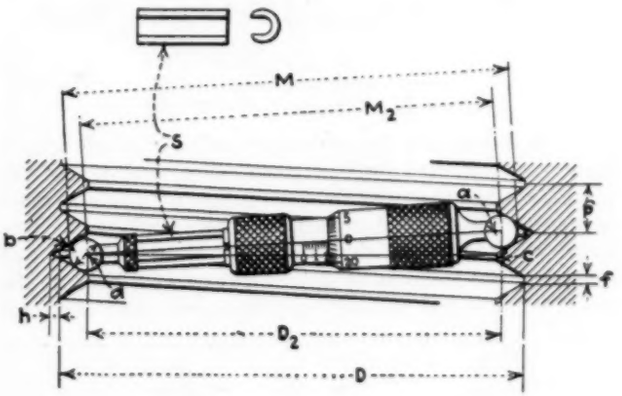
Using a Ball-Pointed Mike for Internal Thread Measurement

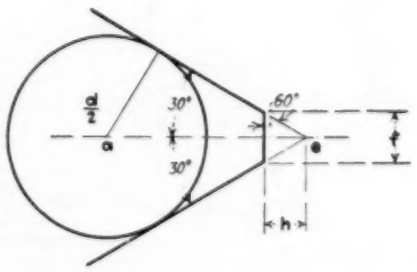
WILLIAM S. ROWELL

Measuring or duplicating internal threads is not an easy matter. Plug or other gages are expensive and can hardly be used on occasional work of odd sizes. The method illustrated was devised to measure and check the threads in several relatively long sleeves with a thread 5 in. O.D. and of 4 pitch, U.S. or American form. To avoid the necessity for plug gages I put ball points 0.15 in. in diameter on an inside micrometer as shown. A slotted or U-shaped sleeve, as *S*, was made to slip over the barrel to hold it for measuring and yet permit it to be telescoped so that it could easily be put in position or removed from the thread. This sleeve was made one inch long for convenience in reading the micrometer.

In use, the micrometer was set to a size slightly less than the thread to be gaged, the sleeve removed and the screw telescoped. The micrometer was then inserted in the thread, the slotted sleeve replaced and the micrometer adjusted to the threads. Removing the slotted sleeve allowed the micrometer to be readily removed.

Having obtained the measurement, either square root or trigonometry may be used to check the measurements over the ball points. Some will prefer the square-root





method while many tool makers are likely to use trig. The data and mathematics are given for both methods, the result being almost identical. A careful study of the diagram will show the different measurements mentioned. *M* is the dimension required to give the proper depth of thread. The use of the micrometer shows just how much metal needs to be removed while a plug gage does not enter until the size is right, or too big.

Given: $D = 5$ in.
$p = 0.25$ in.
$d = 0.15$ in.

M is the measurement over the balls required.

Then: $f = \frac{p}{8} = 0.03125$ in.

Since a 60-deg. thread is specified:

$$\tan 60^\circ = 1.7320 = h \div \frac{f}{2}$$

And $$h = \frac{1.7320 \times 0.03125}{2} = 0.02706$$

But $D_2 = D + 2h - 2d$ because the distance between the root of the thread and the center of the ball is the hypotenuse of a 30–60–90 deg. triangle of which the radius of the ball is the smallest side. That is the hypotenuse *ae* equals twice the radius or *d*.

Then $$D_2 = 5 + 2 \times 0.02706 - 2 \times 0.15$$
$$= 5 + 0.05412 - 0.30 = 4.75412$$

Square-root method:

$$M = M_2 + d = \sqrt{D_2^2 + ac^2} + d$$

But $$ac = \frac{p}{2} = 0.0125$$

$$M = \sqrt{(4.75412)^2 + (0.125)^2} + 0.15$$
$$= 4.7557 + 0.15 = 4.9057 \text{ in.}$$

Trigonometric method:

$$M = M_2 + d = \sec abc \times bc + d$$

$$\tan abc = \frac{ac}{bc} = \frac{0.125}{4.75412} = 0.02629$$

Then $abc = 1^\circ\ 30'\ 22''$
$\sec abc = 1.00035$
$M = 1.00035 \times 4.75412 + 0.15$
$= 4.7557 + 0.15 = 4.9057$ in.

Assembling High-Pressure Hose and Fittings

J. CONRAD WATSON
Master Mechanic, Franklin Pottery

In nearly every manufacturing plant, hose is used for steam, air, or liquids. I wonder how many mechanics have pushed and twisted a hose in trying to get it over the shank of a fitting.

Recently a new 1¼-in. 400-lb. wire-wrapped steam hose was to have fittings at each end. A fitting was held in the bench vise, and after reaming some of the rubber out of the end of the hose, two of us tried to get it over the shank of the fitting by twisting and pushing it at the same time; then four of us, but to no avail. Then we tried the following method: The fitting was held in a chuck screwed on the nose of the milling machine spindle. A piece of steel rod of a diameter that would pass through the fitting was inserted far enough into the hose to clear the end of the coupling shank. The hose was then clamped in the machine vise, the steel rod preventing it from being crushed. Revolving the spindle by hand, the hose was fed to the fitting and forced on the shank by means of the cross-feed.

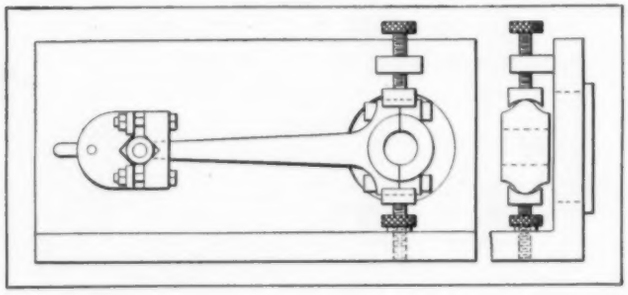
The same principle was employed in putting the ⅛- and ½-in. hose for our De Vilbiss spray painters over the fitting shanks, except that the lathe was used in place of the milling machine. The hose was put through the hollow spindle and was held in the chuck, wood blocks

being interposed between the chuck jaws and the hose to prevent injury. The fitting was clamped to a piece of steel held in the toolpost. Revolving the spindle by hand, the fitting shank was forced into the hose by feeding the carriage along the bed. When fittings are to be inserted by either of the above methods, the hose should be held as near the end as is possible.

Connecting Rod Boring Fixture

HERBERT F. CRAWFORD

Connecting rod bearings of automotive engines of all kinds wear out as a matter of course and usually need reboring at fairly frequent intervals. The shop of May & Son, Roanoke, Va., handles quite a lot of this work and has devised a fixture for holding rods of various sizes while being bored. This fixture consists primarily of an angle casting which bolts to the lathe carriage



saddle in place of the compound rest. The slot at the left carries a V-block that is adjustable for rods of varying length and locates the small end of the rod.

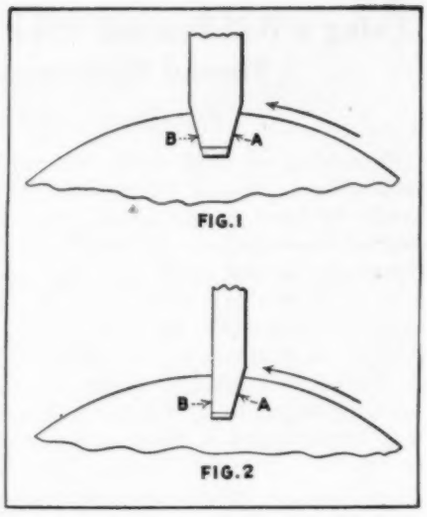
The large end is centered by the bolt bosses, adjustable V-blocks centering the rod vertically as shown. Parallelism is secured by checking the piston pin hole and the boring bar used. By making the front end V-block adjustable and having a large hole in the upright for the boring bar, both large and small rods can be handled on the same fixture. Boring bars with adjustable cutters enable the bores to be trued up and cut to proper size.

Correct Shape of Index Pins and Notches

R. H. KASPER
Master Mechanic,
Steel Heddle Manufacturing Company

Indexing fixtures lose their value when either the indexing pins or their notches become worn. For this reason, cylindrical pins fitting into round holes are not satisfactory under severe usage. The conical pin fitting into taper holes is better, as it takes up any wear that may occur. The flat, taper pin fitting into V-shaped notches is still better, as the surfaces that are subject to wear are broader. However, none of these pins will insure accurate indexing after wear has taken place.

A flat, taper pin, engaging a V-shaped notch is shown in Fig. 1, the index plate being revolved in the direction indicated by the arrow. If the plate is turned too far, the pin will slide along the surface *A*. If it is not turned far enough, the wear will take place on the surface *B*. Since one surface is likely to wear more than the other, the plate will be indexed away from its correct position, though the pin will still hold it firmly in place against turning.

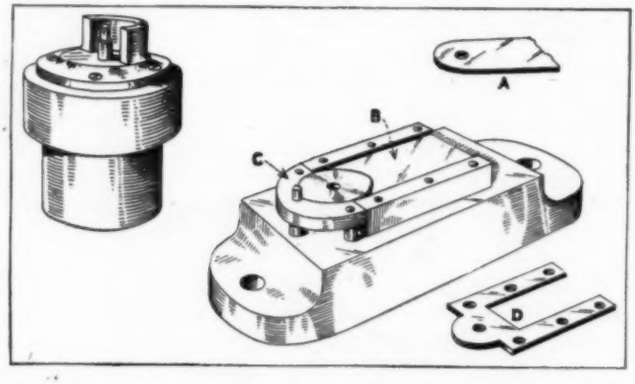


A more accurate indexing pin and notch are shown in Fig. 2. One side of both the pin and the notch is straight and radial. When this pin engages its notch the surface *A* only is subject to wear, the surface *B* being used only to hold the plate against the pin and not to draw the plate into position.

Simple Piercing and Trimming Tools

CHARLES H. WILLEY
Superintendent of Manufacturing,
Hoyt Electrical Instrument Works

Shunt metal used for resistance strips in a cell-testing device of our manufacture costs about one dollar per pound, so that the need for prevention of waste is quite apparent. The metal comes in sheets and is cut into strips 30x$\frac{1}{8}$ in., each strip requiring to be trimmed and pierced at the ends, as at *A*. Since we wanted to do the work at each end in one operation, and with the least



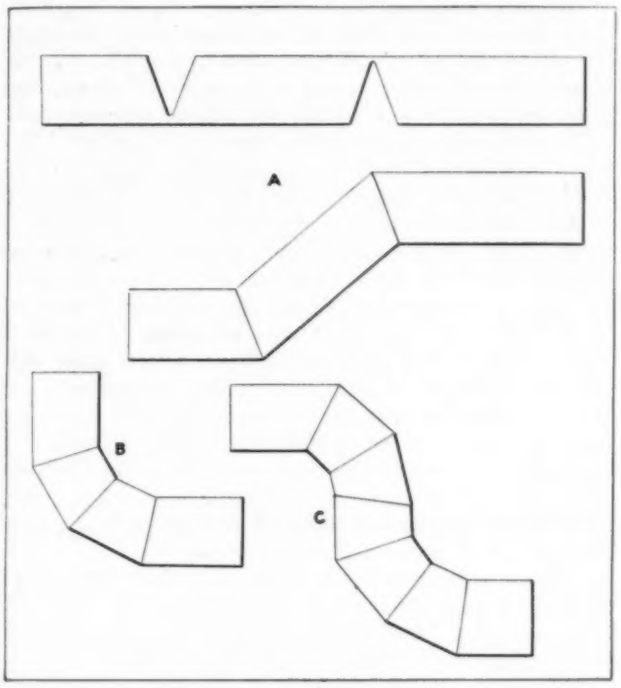
possible waste of material, we made the simple tools shown in the illustration.

The guide block *B* and the stop plate *C* permit the easy feeding of the strips to the outer edge of the round die. Since the stop pin is but $\frac{1}{32}$ in. from the edge of the die, but a trifle is trimmed off of the ends of the strips. The stripper *D* is shown removed from the guide plate so as not to hide the details. The stop plate is mounted on pins backed by stiff springs concealed in the die-shoe, and is depressed by the punch as it descends. The work was done in these tools at a labor cost of four cents per hundred.

Pipe Bends by Cutting and Welding

HENRY C. FRANCIS

Special pipe bends in large pipe are made in the Roanoke shops of the Norfolk and Western by the cut and weld process. A simple case of offset is shown in the sketch at *A*. Knowing the bend desired the necessary number of V's are cut out of the pipe at proper places



and of the angles to give the shape wanted after the pipe has been bent and welded. The V cuts do not go entirely across the pipe but leave metal enough to hold the pipe wall together after bending and before welding.

Large radius elbows are made as at *B* while double curve bends as *C* can be made by cutting out V's of the proper size and at the right points. The method can be used in many places to advantage.

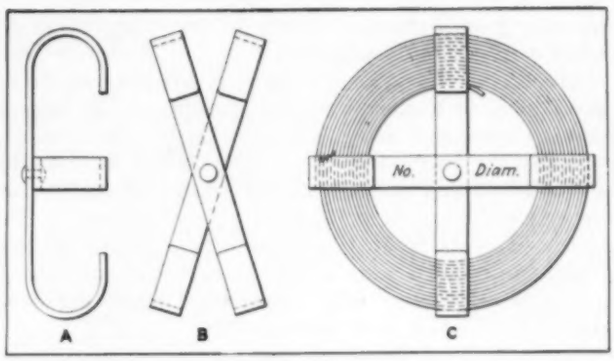
Avoiding Trouble in Winding Springs
Discussion

K. A. ANDERSON
Foreman, J. L. Clark Manufacturing Company

After reading the article by H. L. Wheeler, under the title given above (*AM*—Vol. 74, page 770), I thought our method of handling coils of spring wire might be of interest to others.

We make containers out of two pieces of flat iron about $\frac{1}{8}$x$\frac{1}{2}$ in., bent into the form shown at *A* and lightly riveted together in the center with a single rivet. With the arms in the position as shown at *B*, the coil of wire is inserted, being pushed under the hooked ends. Then the arms are moved so as to be at right angles with each other, as at *C*. The binding wires are now cut, allowing the coil to expand as far as the hooked ends of the arms will permit. This makes a very compact package.

The coil is unwound from the center by pulling out



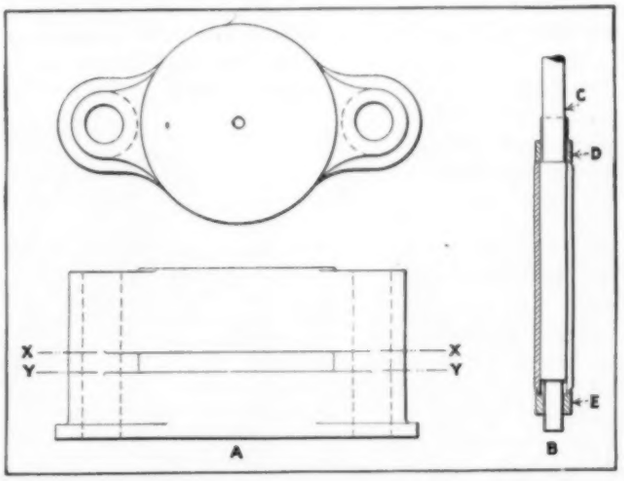
the innermost end of the wire. Stamping both the number and the diameter of the wire on one of the arms identifies the contents of the package. Containers are made for each size of wire used and the coils are kept in them permanently.

Boring Die Sets for Leader Pins
Discussion

JAMES R. CORNELIUS
Coventry, England

In an article under the title given above (*AM*—Vol. 74, page 587), A. Archbold describes a method of boring die sets for leader pins, utilizing a lathe fitted with two faceplates. Though this method will undoubtedly give good results, I am of the opinion that it is slow and cumbersome, and in this respect is similar to the original method of bolting the two members to two parallel faceplate angle plates and following the same procedure as is described in the article referred to.

Where die sets are required in considerable quantity, the following method of boring for the leader pin will be found much simpler than that advocated by Mr. Archbold. It can also be used where but one die set is required. Since the upper and lower members of die sets are castings, it is quite as simple to cast them both in one piece as it is to make separate castings of each. In the illustration at *A* is shown a casting in which the upper and the lower members are integral. After annealing, both sides of the casting are machined and the holes for the leader pins are bored and lapped. The casting can then be parted at the lines *X-X* or *Y-Y* to



separate it into the two members, depending upon the relative thickness of each.

The boring should be as close as is possible and should be followed by a careful lapping operation. The lapping tool is shown at *B* and can be used in the same machine in which the boring is done. It consists of the mandrel *C*, hardened and ground so that the taper shank (not shown) and all parts of the body will be concentric. The body is slightly tapered, not more than 2 deg. included angle, and is fitted with a copper sleeve, the outer diameter of which is from 0.002 to 0.003 in. below the diameter of the holes it is required to lap.

If the ends of the sleeve are chamfered at an angle of 45 deg. and the nuts *D* and *E* are countersunk to the same angle, any tendency of the ends to swell when the nuts are tightened will be avoided. To permit the sleeve to expand as it is moved up on the taper of the mandrel, it must be slit along its entire length either by a straight or a helical cut.

The sleeve is charged with abrasive by rolling it between two hard, flat plates, the surfaces of which have been coated with a mixture of oil and abrasive. After charging, the sleeve should be washed in kerosene to clean it of surplus abrasive. A dull surface denotes that a full charge of abrasive has been left upon it after washing. In lapping, the lap should be constantly kept moving up and down as it is being rotated, so as to bring its entire length into contact with the walls of the holes. A copious supply of kerosene should be applied throughout the process, since the kerosene will dislodge all dulled particles of abrasive. It also aids in cutting.

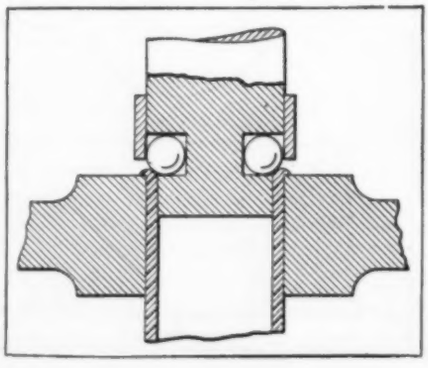
When no bushings are to be used for the leader pins, the holes should be thoroughly cleaned with gasoline to insure the removal of all abrasive from them. A small hole bored through the center of the members is very useful in setting up for any machining that is to be done after the casting has been parted.

A Ball-Bearing Beading Tool

CHARLES KUGLER

A quantity of handwheels were to be mounted on steel tubes that were a drive fit in the holes. As a matter of insuring that the wheels would not come off of the tubes in use, the ends of the tubes were beaded over to the faces of the hubs.

The first beading tool we made did not last long, as the friction caused flats in the beading groove, rendering it unfit for further use. Then the tool shown in the illustration was made. A square groove just above the pilot was filled with steel balls which were kept in place by a short sleeve fitting tightly on the body of the tool. The lower end of the tool, including the pilot and the grooved part, was hardened. It worked well.



SEEN AND HEARD

JOHN R. GODFREY

"When a Tube Is Not a Tube"

The superintendent had invited me to go through the plant and look over some of the changes he had made. He wanted to get his routine work out of the way before we started, and I waited in his office. I noticed that he looked over some material requisitions very carefully and just to make conversation, I remarked on it. "Yes, I am," he replied, "but not as careful as I used to be. When I was a foreman for a very big concern, the waste of material because of careless ordering was appalling. I made up my mind that if I ever became superintendent I would watch all special material requisitions carefully.

"Later I became superintendent of a plant where one of the products was electrical measuring instruments. Some of these had wire pointers and other, more delicate, had pointers of aluminum tubing. Soon after my induction into the new position an order came across my desk for half an ounce of aluminum tubing, 0.020 I.D. x 0.040 O.D. I looked this over with my usual care, and concluded that the instrument foreman had made a mistake. I thought he had intended to order half a pound. Accordingly I changed it to a half pound.

"Time passed and much water ran under the bridge. One day a long parcel came, and with it a bill for $400. I was asked if I had ordered 1,200 feet of tubing, that, incidentally would take several years to use.

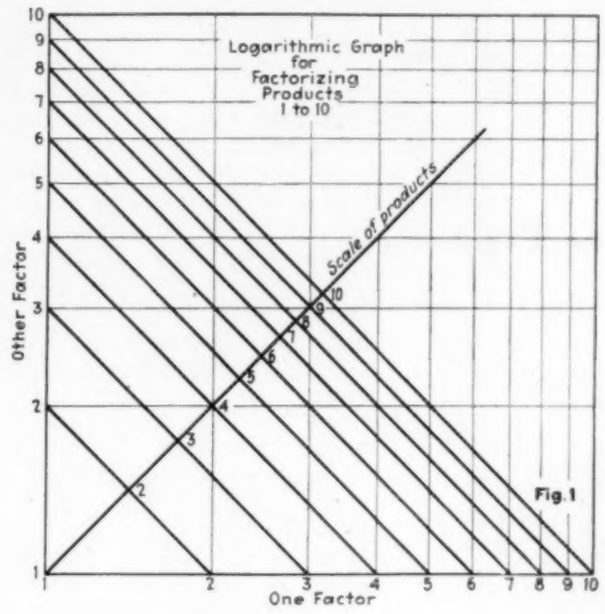
"At first I indignantly denied it, but the original order with the change made in my own hand writing nailed me fast, and with the tubing in one hand and the bill in the other, I headed for the G. M.'s office.

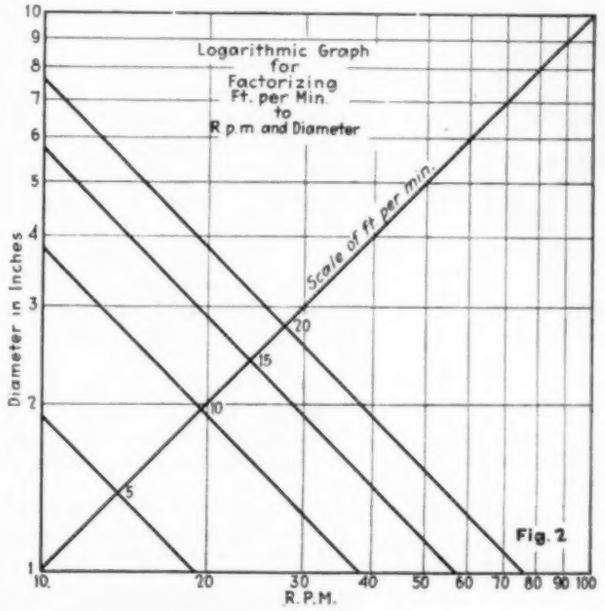
"Now I'm careful, but not careful enough to increase the quantity on any order. I make all the mistakes it is possible to make, but the reason I hold my job is because I make the same one only once. Come on, let's go out in the shop."

Cast or Welded?

Cast steel, according to William M. Sheehan, assistant to the vice-president of the General Steel Castings Corporation, has nothing to fear from welded construction. Both have common meeting grounds where it may sometimes be difficult to choose between them, but both on the other hand have fields where one is definitely better than the other. Large steel castings subjected to tremendous intermittent stresses, such as in locomotive beds and car underframes, have lately been winning "hands down" over built-up construction. But, Mr. Sheehan says, the steel foundries themselves are big users of welding, and these enormous one-piece steel castings would not have been commercially possible without the aid of welding and the cutting torch. On the other hand, the welding advocates are using steel castings for ends, bases and other massive or complicated parts of built-up structures. Cooperation between the steel casting and the welding industries seems to be the order of the day.

GRAPHIC CALCULATIONS





THIS type of logarithmic graph is of great use in both drawing office and workshop to obtain rapidly the factors which go to make up a constant, e.g., to find the various diameters and r.p.m. which make up peripheral speeds of drills, milling machine cutters and lathe jobs, or, widths and thicknesses to give a certain weight of metal. The construction is extremely simple and the graph can be read at a glance by anyone.

The graph is based upon the fact that if lines be drawn at 45 deg. on logarithmic paper, then the product of horizontal and vertical values which intersect on any of the sloping lines is a constant for that sloping line. This is illustrated in Fig. 1. Take the sloping line marked 10.

A moment spent in inspection of the graph will show the following intersections:

Horizontal	8	5	4	3	2
Vertical	1.25	2	2.5	3.33	5
Product	10	10	10	10	10

or again line 3 will show:

Horizontal	3	2	1.5
Vertical	1	1.5	2
Product	3	3	3

To make the scales of greater magnitude multiply by 10 or multiples of 10, but when this is done the values of the sloping lines change, i.e. the products change. If we increase horizontal or vertical to ten times their value the product lines change to ten times the value; if we increase both horizontal and vertical to ten times the value, then the product lines increase to 100 times, and so on.

Take as an example a graph to factorize peripheral speed of milling cutters, etc., into diameter in inches and r.p.m. The relations between diameter and r.p.m. are given by

$$V = \frac{\pi D \times r.p.m.}{12}$$ where V is peripheral speed in feet per min. and D is diameter in in.

from which:

$$D = \frac{12 \times V}{\pi \times r.p.m.}$$

and $$r.p.m. = \frac{12 \times V}{\pi \times D}$$

For simplicity, let the peripheral speeds be limited to 5, 10, 15 and 20 ft. per min., then, by substitution of these values of V together with assumed values of D in the one formula and $r.p.m.$ in the other it is possible to get the following table:

V in ft./min.	D in inches when r.p.m. = 10	r.p.m. when D = 1 in.		Remarks
5	1.91	19.1	—	Notice relation
10	3.819	38.19	—	between values
15	5.729	57.29	—	of D and
20	7.638	76.38	—	r.p.m.

The values from the D column are plotted along the vertical axis (see Fig. 2), the corresponding values from the r.p.m. column along the horizontal axis, and each pair of points joined by a sloping line. This is clear from the graph. Any number of graphs can be drawn by extending the number of values taken.

The resulting graph is so simple to read that only one or two cases will be given:

(a) Suppose a peripheral speed of 20 ft. per min. has been quoted and the revolving part is 4½ in. in diameter, then, by reading 4½ in. on the vertical, following this line horizontally to the right until it cuts the 20 ft.-min. line, and tracing vertically downwards, the r.p.m. are found to be 17.

(b) Now suppose a 4-in. diameter shaft is revolving at 19 r.p.m. By tracing 4 horizontally and 19 vertically, a peripheral speed time of about 20 ft.-min. is found.

(c) In the case where r.p.m. and peripheral speed are quoted, say 40 r.p.m. and 15 ft.-min., trace the 40 vertically until it cuts the 15 ft.-min. sloping line and then horizontally; the figure for diameter in this case is 1.43 in.

The range of this graph can be increased by multiples of 10 as previously stated, and any number of product lines can be added merely by calculating one point and drawing a line sloping at 45 deg. through that point. There are a great many uses of this simple device and others are sure to suggest themselves to users.

Contributed by E. Blakemore, Principal, Technical College, Railway Mechanics Institute, Horwich, England.

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SHOP EQUIPMENT NEWS

"Milwaukee" Nos. 1 and 2 Knee-Type Milling Machines

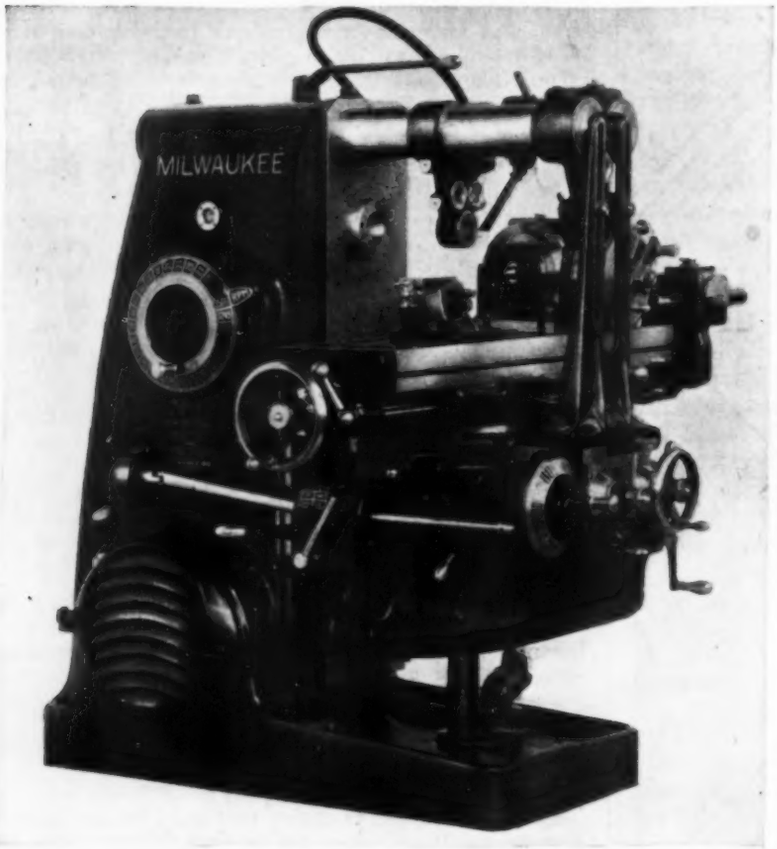


Fig. 1—Milwaukee Universal Milling Machine, which has a spindle speed range for tantulum- and tungsten-carbide cutters

A complete series of knee-type "Milwaukee" milling machines has been announced by the Kearney & Trecker Corporation, Milwaukee, Wis. Outstanding features of these machines include: a greatly broadened range of spindle speeds from 15 to 1,500 r.p.m.; feeds from ¼ to 60 in. per min.; a center-bearing spindle with worm drive; a "sponson-type" knee; a stabilized column, and multiple V-belt drive, with the motor set at right angles to the spindle.

The milling machines are available in two sizes, designated as Nos. 1 and 2, each of which is offered as follows: the horizontal type in three models—universal, plain, and manufacturing; and a sliding-head vertical type in two models—plain and manufacturing. The universal machine is illustrated in Fig. 1. These machines are suited for use with tungsten and tantalum-carbide milling cutters.

The speed range usually employed heretofore in knee-type milling machines has been approximately 25 to 1. For these Milwaukee machines a 100 to 1 speed range has been selected with 15 r.p.m. as the lowest, and 1,500 r.p.m. as the highest speed. This range permits surface speeds in either direction as low as 50 ft. per min. for a 12½-in. cutter and as high as 100 ft. per min. with a ¼-in. cutter. In order to avoid large gaps between increments, 27 changes are provided in geometrical progression.

To obtain high speeds and heavy torque in the same spindle, the 27 speeds have been divided into three series of nine each. The nine highest speeds are obtained through silent worm gearing, with the worm mounted directly on the spindle. Although the spindle revolves at speeds as high as 1,500 r.p.m., no other shaft or gear in the entire spindle train runs faster than 600 r.p.m. The nine intermediate speeds are obtained through a hardened steel spur gear in combination on the spindle with a large heavy-duty bull gear for the nine lowest speeds. The bull gear is mounted on the spindle and acts as a flywheel. Drive is through multiple-splined keys cut solid on the spindle. The sliding gears, meshing with the intermediate gear and the bull gear, are in a neutral position when the high-speed worm drive is

Fig. 2—Close-up of spindle speed indicating dial affording 27 steps in geometrical progression

Fig. 3—Louvred door open to show V-Belt drive and fan-type sheave for ventilation

in action. An anti-friction bearing is placed between the spindle drive worm and the intermediate bull gear combination, which means that both series of drives are closely supported between bearings at all times.

The 27 speeds are obtained by a single lever in combination with a large direct-reading dial, as shown in Fig. 2. The lever has but one position and can be revolved clockwise or anti-clockwise for higher or lower rates. This dial is visible at a distance of 40 to 50 ft. from the machine and enables checking up by the foreman or superintendent.

The spindle itself is carried on three bearings placed at approximately equal distances apart which makes for a much stiffer arrangement than ordinarily found. The front and center bearings are arranged to take both radial and thrust loads, while the rear bearing is of the straight roller type. The spindle driving train is carried on a double wall plate in the column. All driving gears are supported between these two walls on short shafts carrying multiple splines, and all gears are closely supported between anti-friction bearings.

To give a wide range of feeds, the Milwaukee machines have a 240 to 1 feed range. The feed range is from ¼ to 60 in. per min. in 27 changes, in geometrical progression. The lever and dial for the feed are on the front of the knee, readily accessible from the operator's normal position. The dial is large in diameter and can be easily read 30 ft. away.

In the manufacturing-type machines both the speed and feed changes are made by means of pick-off gears. Twenty-four speed changes are provided, covering the same range as the quick-change mechanism. The range is from 15 to 1,500 r.p.m. The feed range is accomplished by eight pick-off gears, providing 24 changes of feed from ¼ to 60 in. per min.

The front arbor-support bearing is much like the former design, although it is supplied with an oil reservoir which makes the adjustable bushing self-oiling. Heretofore when a gang of cutters was being used that required a center support, the arbor could not be removed from the machine without first taking off the cutters. With the improved construction, the center arbor support is hinged in two halves, each bored to fit over one overarm and accurately locked together. When it is desired to remove the arbor with its cutters assembled, each half of the hinged arbor support is swung around its respective overarm, and the arbor can be removed with its cutters intact. This feature preserves the original cutter spacing and enables setting up and spacing of cutters on a spare arbor for the next job.

The knee resembles an H-column, and the ways at the top are wide and heavy with closed box-section walls and heavy projections at each side at the bottom in the form of "sponsons." Another feature is the bearing of the knee on the column face, which is very long, extending to the top of the saddle. Both the knee and column are locked solidly together by a clamp operated by a handle at the side of the knee. The fact that the knee is completely inclosed makes flooded lubrication possible.

The motor is mounted at right angles to the spindle, making the motor accessible from both ends of the column. Adjusting screws are provided to keep the V-belts at proper tension. The V-belt drive is covered by a door in which louvres are cast to admit air for ventilation. Fig. 3 shows the right side of the column with this door open. The driving pulley is of fan construction to draw air in through the louvres, force it past the motor and out through the louvres in the door at the opposite side.

To attain the maximum strength with the least height between the top of the knee and the top of the table, a center-ribbed saddle is employed. This rib extends into a channel provided on the top of the knee. The saddle is locked to the knee by a handle easily reached under the table.

All models are provided with rapid traverse in six directions. The rapid-traverse, multiple-disk clutch runs in oil and is carried by a double wall plate at the front of the knee. This clutch can be adjusted without removing the plate from the knee. Engaging the rapid traverse does not disengage the feed, and when the handle is released the feed automatically picks up where the rapid traverse lets go. As a safety measure, when the rapid traverse is being used to run the work up to the cutter, the table dog releases the clutch and the feed is then reengaged with the reverse lever. The rapid traverse for the longitudinal travel of the table is 150 in. per min.; for the knee and saddle, 75 in. per min.

Operating handles are placed so that they will be in the most natural position for the operator. To overcome the possibility of grasping the wrong handle, each handle is given a different shape or is made from a different material. The starting lever is directly in the center of the machine at the top of the column, and can be adjusted to any location for convenient operation, either from the front of the table or at the rear of the table, either side of the machine. Feed and rapid traverse levers are in duplicate, one set for operating the machine at the front and the second set for operating the machine from the rear of the table.

The sliding-head vertical machine is furnished either as a plain machine with 27 speeds and feeds through a quick-change mechanism, or in a manufacturing type with pick-off gears for 24 speeds and feeds. The head has vertical travel of 6 in., and can be furnished with power feed and rapid traverse and with the full range of 27 feeds from ⅛ to 30 in. per min. Rapid traverse is at the same rate as the cross and vertical traverses, namely 75 in. per minute.

A four-step dial indicator precision stop is provided so that step milling

can be done. If three of four heights are to be milled, the slide is permitted to go up by rapid traverse to a height determined by one of the trip blocks. It is then run down by rapid traverse and tripped out by one of the screws on the precision stop. The handwheel is then used to lower the head a few thousandths to the zero point on the dial. A close-up of this mechanism is shown in Fig. 4.

Automatic flooded lubrication is supplied for all gears, shafts and internal mechanism throughout the machine. The box-section column provides a large reservoir for lubricant. An oil filter operates continuously. Since the knee is completely inclosed, a small constant-speed pump is used to give automatic flooded lubrication.

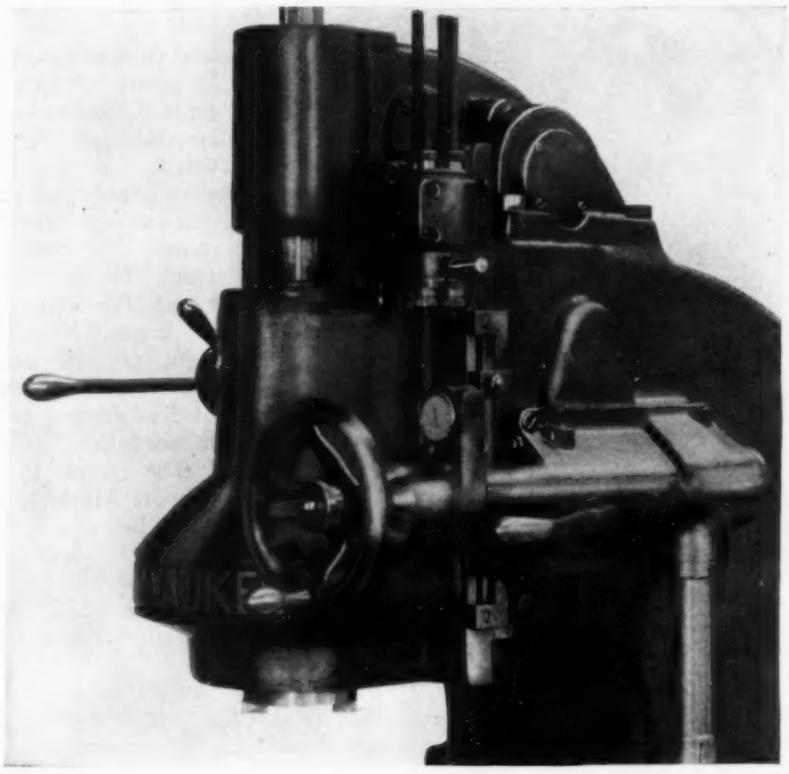
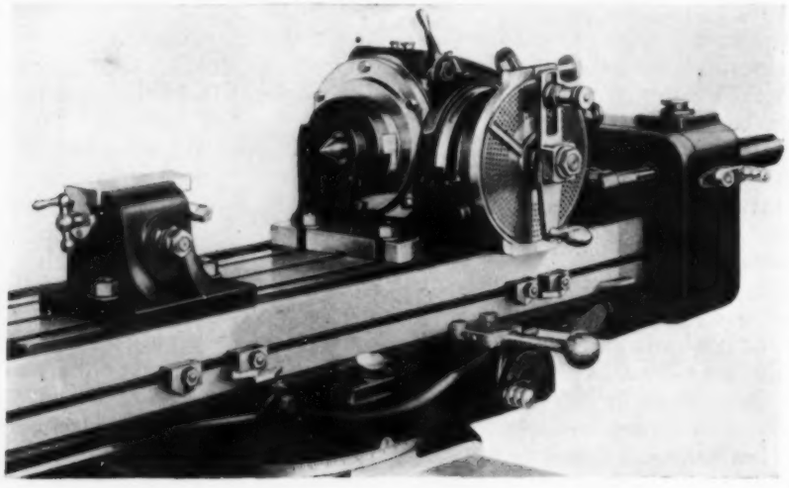


Fig. 4—Close-up of sliding head on vertical machine, showing dial indicator, stops and controls for step milling

Fig. 5—Dividing head for any number up to 500 and leads from 38 per in. to 240 ft. per turn in 40,000 steps



A reservoir for cutter coolant is contained in the base of the machine.

The primary dividing mechanism of the dividing head consists of a pair of accurately mated hypoid spiral bevel gears. Fig. 5 shows one of these heads. The gear and pinion have a ratio of 5 to 1, affording quick indexing on small numbers, which constitutes the greater part of toolroom work. The index plate is made double, that is, two pieces fastened back to back to permit the holes to be through-reamed. Limitations of milling short leads have been overcome because the dividing head divides all numbers to 500 and provides over 40,000 leads ranging from 38 threads per inch up to 240 ft. per turn. This is accomplished by means of a spiral lead gearbox which bolts to the end of the table. The mechanism in this box can be driven either from a shaft which parallels the table screw or from the table screw itself.

By means of a self-compensating clamp ring on the large diameter hub of the hypoid spiral gear, the spindle is clamped without side pressure. The usual graduations are provided, and the spindle can be set at any desired angle from 10 deg. below horizontal to 10 deg. beyond the vertical. The flange on the front end of the head spindle is the same size as the standardized end of the milling machine spindle, and it has the same taper hole as the main spindle. Three bolts passing entirely through the spindle hold the chuck. The head center collet, which carries the dog driver, extends all the way through the spindle, where it receives change gears when necessary for dividing certain numbers that cannot be divided with the index plate direct.

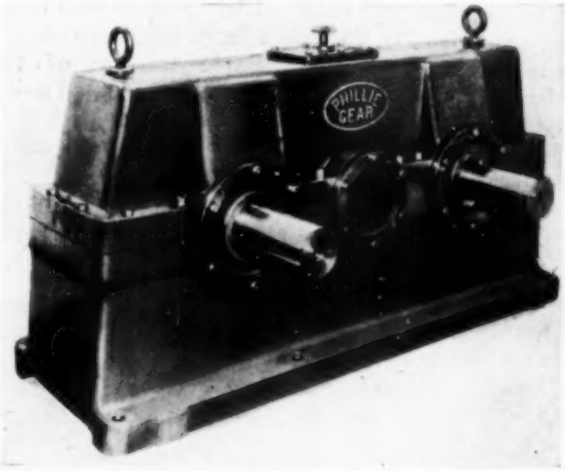
Circular milling can be done since the dividing head spindle can be rotated by power without engagement of the table screw. The dividing head in that case becomes a rotary table which may be operated either with the spindle in horizontal or vertical positions or at any angle in between. In addition, the dividing head may be set crosswise of the table so that the head spindle and main spindle of the machine are parallel. A right-angle drive mechanism can be furnished at additional cost, so that the dividing head can be revolved in this position with or without feeding the table. This arrangement makes it possible to mill uniform cams of any lead, varying by such small amounts as 0.0001 in., the smallest lead milled being 0.022 inch.

A thread milling attachment can also be furnished, which permits the milling of all threads from 38 to 1 per inch, and in addition 11½ threads per in. for pipe threading. Threads can be milled on a taper by elevating the tail center and setting the dividing head at the proper angle.

"CP" No. 335-130 Rotary Pneumatic Wrench

Philadelphia Welded-Steel Speed Reducer Housings

The speed reducer units manufactured by the Philadelphia Gear Works, Erie Ave., & G St., Philadelphia, Pa., are now available with housings made of welded, rolled steel. These housings will resist impacts from heavy objects which would normally crush a cast-iron reducer housing. The speed reducers so housed are smooth-running, quiet in operation, and afford longer gear life from absence of vibration. Representative types are: horizontal wormgear reducers; straight-line-drive, spur-gear reducers; straight-line drive, continuous-tooth herringbone reducers, right-angle-drive, spiral bevel-gear speed reducers, and others.



Philadelphia Herringbone Gear Speed Reducer for straight-line drive, employing a welded steel housing for quietness and great strength

"CP" No. 335-130 Rotary Pneumatic Wrench

The No. 335-130 rotary pneumatic wrench, announced by the Chicago Pneumatic Tool Co., 6 East 44th St., New York, N. Y., is suitable for tightening and removing nuts on bolts up to and including 1¼ in. It is suitable for tightening flexible staybolt caps, cylinder and valve chamber head nuts, dome nuts, front end nuts, and frame nuts. The sockets are a snap fit on the spindle, assuring quick and easy replacement when a different sized socket or reverse motion is wanted.

The light speed is 130 r.p.m., the over-all length, 7/7/32 in., and the weight, 48 lb.

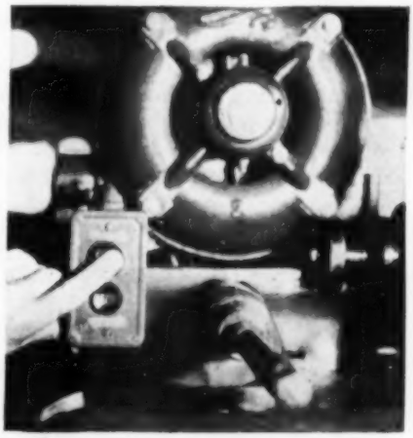
"Sil-Fos" Silver Alloy for Brazing

A low-cost, low-melting-point silver alloy for brazing has been announced by Handy & Harman, 57 William St., New York, N. Y. This "Sil-Fos" alloy contains only a small percentage of silver and flows freely at 1,300 deg. F. It is applicable to work where higher-melting-point, base-melting brazing or welding alloys cannot be used without danger of weakening, distorting or destroying the parts adjacent to the joint. Sil-Fos flows freely. At 1,400 deg. F., which is the flow point of the borax flux with which it is generally applied, the alloy has 100 deg. of superheat, which acts so as to increase the fluidity still further and aids penetration and alloying action. The alloy also requires less than the usual amount of flux because of the deoxidizing effect of the phosphorous in the alloy. This characteristic should tend to reduce the cost of cleaning and finishing after the joints have been made with the alloy.

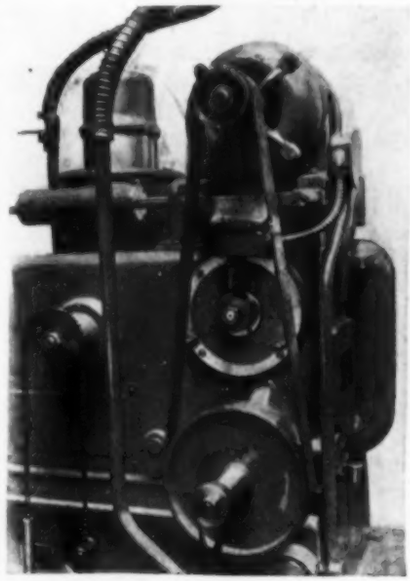
Lap joints in copper sheets show a tensile strength of approximately 30,000 lb. per sq.in., and the alloy can also be used for joining brass, bronze, nickel, nickel-silver, extruded brass and bronze, monel metal, and other metals and alloys fusing above 1,300 deg. F.

Automatic Electrical Control for Fellows High-Speed Gear Shapers

When arranged for motor drive, the Fellows high-speed gear shaper, manufactured by the Fellows Gear Shaper Company, Springfield, Vt., is now provided with an automatic elec-



Push-button control on the Fellows High-Speed Gear Shaper equipped for motor drive



Rear view of Fellows Gear Shaper, showing the automatic electrical operating switch and mechanism for stopping the machine

trical control. The machine has a push-buttom station, as shown in Fig. 1, mounted on an auxiliary bracket. The machine is stopped automatically when it has finished its complete cycle by an electrical control switch attached to an extension on the rear of the motor bracket. This switch is operated by a plunger, as shown in Fig. 2. The plunger is acted upon by a cam that is held on the same shaft as the regular feed cam, and is timed with the latter. When the roll on the saddle operating rack reaches the high point on the speed cam, and just before the roll drops into the depression, the switch operating cam lifts the plunger, breaking the circuit and stopping the machine. Then the roll drops into the depression of the feed cam, allowing the saddle to return to its rear position. The plunger drops into the depression on the control cam to close the circuit and to allow the machine to be started again.

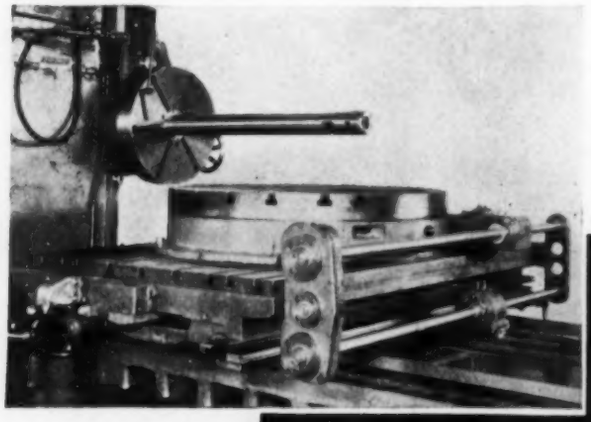
Ohio Horizontal, Boring, Drilling and Milling Machine

A special horizontal, boring, drilling and milling machine for exceptionally large jobs has been developed by Joseph T. Ryerson & Son, Inc., Chicago, Ill., in conjunction with the Ohio Machine Tool Company, Kenton, Ohio. The following specifications illustrate the machine's size: diameter of spindle, 5 in.; continuous feed to spindle, 36 in.; reset to spindle, 40 in.; working surface of table 60x96 in.; cross feed, 94 in.; distance top of table to center line of spindle, 85½ in.; maximum distance faceplate to bar support, 168 in.; eighteen speeds, all reversible; eight boring and drilling feeds, and sixteen milling feeds to the head, table and saddle, also reversible. The feeds are not affected by the drive backgears as they secure their primary drive from the spindle. Centralized oiling systems are furnished to all units.

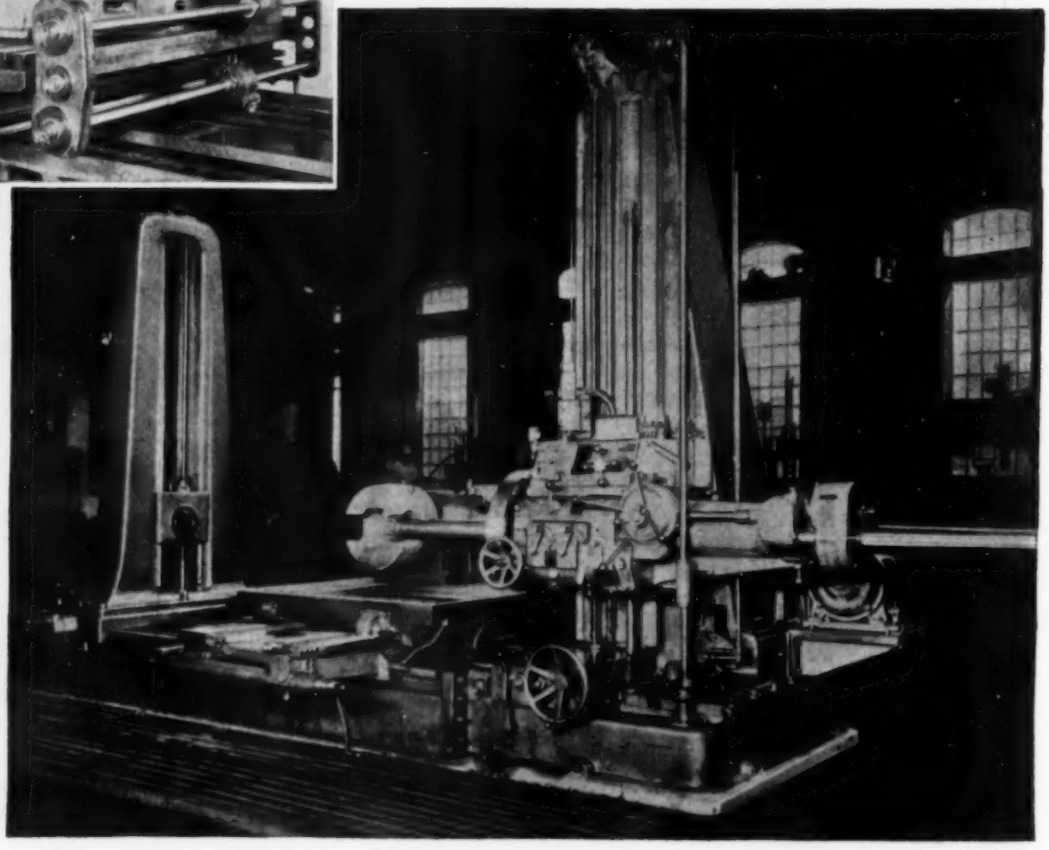
The machine is equipped with a 60-in. power- and hand-driven revolving table, which receives its power feed and rapid traverse from the feed shaft in the bed. It is also equipped with a thread chasing attachment which operates directly from the spindle through a minimum number of gears and shafts to the feed pinion operating on the spindle sleeve. Any number of threads per inch can be cut.

All controls may be operated from the head, with the exception of the directional control levers to the table and table saddle. Spindle final drive is through a large internally driven faceplate. Rapid traverse of the selective type is furnished to all units. All guides are of the square lock type with steel taper gibs fitted their entire length.

The saddle is guided on a bed 54 in. wide by a narrow guide located in the



Above—A 60-in. power- and hand-driven revolving table is furnished



Right—Ohio Horizontal, Boring, Drilling and Milling Machine, which has a 5-in. spindle and is dimensioned for large work

center, with the feed screw directly under the center of the spindle at all times. This arrangement is especially useful in boring holes in conjunction with the regular feed to the spindle. The table can be hand traversed from either side.

The boring bar support is of the closed type with an adjustment to the feeding nut. The outboard bearing travels in conjunction with the main head, as it is driven through special bevel gears and helical tooth spur gears. This unit can be removed from its base, and is traversed on the bed by a gear reduction operating on racks bolted to the bed on each side.

The main post is a heavy box shape casting with two straight and two tapered sides. In its base is a speed box containing three speeds for the driving mechanism. Power is furnished by a 20-hp., constant-speed, reversible-type motor to a silent chain.

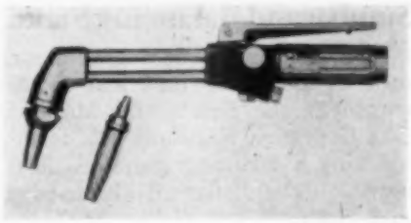
"Prest-O-Weld" Type C-105 Cutting Blowpipe and Cutting Attachment

The Linde Air Products Company, 30 East 42nd St., New York, N. Y., is now offering the "Prest-O-Weld" Type C-105 cutting blowpipe and the Type CW-105 cutting attachment.

"Prest-O-Weld" Type C-105 Cutting Blowpipe

These devices, together with the Type W-105 and W-106 welding blowpipes previously announced, can all be used interchangeably with the same detachable valve body. The cutting oxygen tube is made of Ambrac, a special hard brass, to afford the necessary stiffness. The blowpipe is light and well-balanced. It is furnished as standard with four cutting nozzles for a 75-deg. angle head. A 90-deg. angle head can be furnished. Steel and wrought iron up to 12 in. in thickness may be easily cut.

The cutting attachment is of single-joint design and attaches directly to

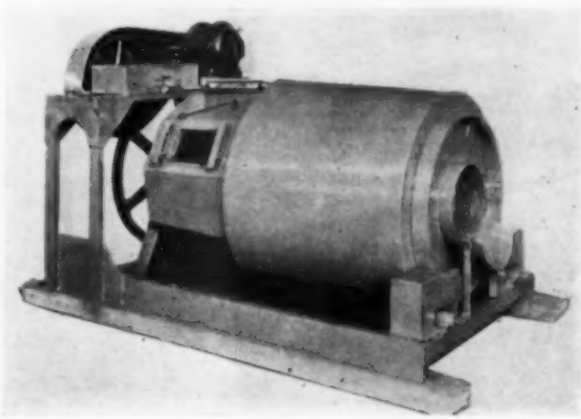


"Prest-O-Weld" Type C-105 Cutting Attachment

the valve body. It will readily cut metal up to 2 in. in thickness. It is furnished with nozzles Nos. 1 and 2 and measured only 11 in. in over-all length.

"Ideal" Burnishing Barrel

An improved burnishing barrel has been announced by N. Ranshoff, Inc., Cincinnati, Ohio. This barrel loads through a door in the periphery in the same way as a standard burnishing barrel. The burnishing operation is the same as the standard type of barrel, in which the diameter is greater than the length. When burnishing is completed the barrel is rotated in the opposite direction by means of a reversing switch in the motor, and thus the work is discharged automatically through the screen in the center of the barrel. The work comes out at the end, the balls passing through the perforations in the screen and they are retained in the cone surrounding the screen. As soon as the work is discharged, the barrel is ready for another load. When the work is loaded and the door in the periphery is shut, running the barrel again in the burnishing direction causes the balls to return to the burnishing compartment automatically. Thus, all work of rehandling the balls is eliminated. This results in a saving of time and enables a larger proportion of balls to work to be used economically.



Whitney No. 28 Toggle Lever Foot Press

A toggle lever foot press with a capacity for punching a 2-in. hole in 16-gage sheet has been placed on the market by the Whitney Metal Tool Company, 110-114 Forbes St., Rockford, Ill. The throat depth of this press is 7 in., the height of the throat, 4 in.; slug clearance hole, $2\frac{1}{4}$x$4\frac{1}{4}$ in., and stroke of ram, 1 in. The ram connections are adjustable, a positive stop locking against the crank arm. The adjustable pedal has six laminated, hardened and ground tool-steel

plates to take up wear, and the laminated disks can be arranged to adjust the stroke position of the ram $\frac{1}{2}$ in. up or down. A bolster-plate type die holder is provided, and the bolster plate has a T-slot to clamp stops or stripper plates. It also has a material support and adjustable stops on either side. Depth gage holes are drilled

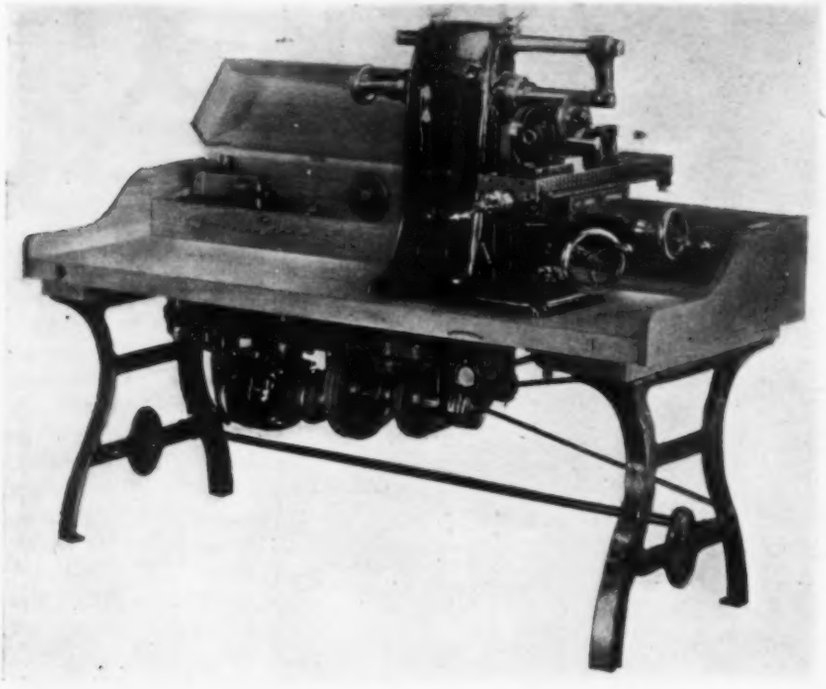
and tapped on either side of head for locating stripper fingers. Speed of operation is 100 holes per minute.

Cataract No. 5 Motor-Driven Bench Milling Machine

The No. 5 bench-type milling machine, announced by Hardinge Brothers, Inc., Chicago, Ill., is driven by a V-belt, under-bench transmission such as used on the No. 4 combination bench lathe and motor-driven milling machine. Two V-belts are used in the drive, and the unit is capable of handling milling in general tool and experimental work.

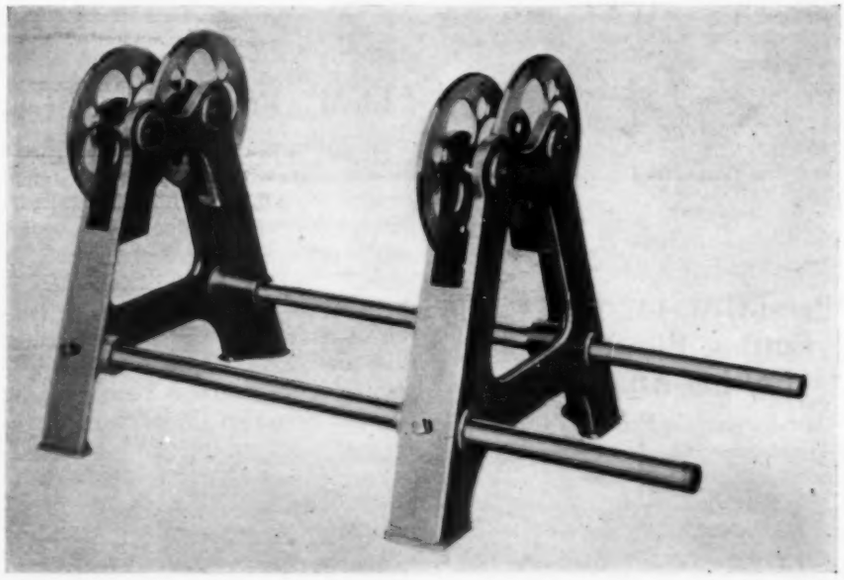
The unit has a range of six speeds from 160 to 1,400 r.p.m., forward or reverse. The bench is rigidly constructed to eliminate vibration, and a collet and attachment box is mounted on the back.

Specifications are as follows: Collet capacity of cutter head, 1 in.; diameter of arbor, $\frac{7}{8}$ or 1 in.; working surface for table, 20x6 in.; movement of table—longitudinal, 1 in.; transverse and vertically, both $6\frac{1}{2}$ in.; maximum capacity of swivel vise, $2\frac{1}{2}$ in.; weight of machine, 340 lb.; weight of bench with transmission, 487 lb., less motor; size of motor, $\frac{3}{4}$ hp., 1,200 r.p.m.



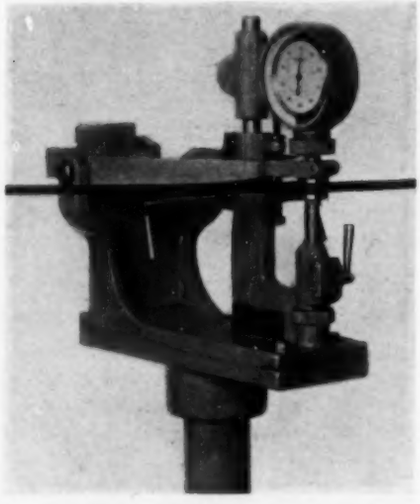
Sundstrand Balancing Stand

For balancing light-weight parts, such as aluminum fans and motor armatures, the Sundstrand Machine Tool Company, Rockford, Ill., is announcing a balancing stand, as illustrated. The balanced knife-edge steel disks are mounted on hardened steel spindles, which revolve on steel balls inclosed in hardened and ground races. The construction is sensitive because of the spindle has a direct pivoting action on the ball bearings. The equipment is portable, and leveling is not necessary. A $\frac{1}{2}$-lb. disc can be thrown out of balance with a 5-grain weight on a 3-in. radius, making it possible to obtain satisfactory results when dynamic balance is too slow or expensive. The tool swings 22 in., maximum distance between standards is 20 in., capacity is 12 lb., and weight of the equipment is 40 lb.



Federal Model 493 Wire Gage

A wire gage for checking to thousandths has been developed by the Federal Products Corporation, Providence, R. I. The dial is graduated in thousands and the range is from 0 to 0.2 in. The indicator is inclosed in a dust-proof auxiliary housing, and the anvils are interchangeable. The adjusting screw provides for set-



Federal Model 493 Wire Gage

ting the gage to any desired size within its range, and safety rocker arm is used for holding anvils out of contact. Proper tension is obtained by a compensating weight. Guide rollers are optional equipment.

Semi-Annual Equipment Review Number—*Erratum*

In the semi-annual equipment review number published last week (*AM*, Vol. 75, p. 124) there was a brief description of a vertical worm gear speed reducer credited to the Dodge-Foote Corporation, Mishawaka, Indiana, as maker. This statement is an error. The item, in fact, is made by the Foote Bros. Gear & Machine Company, Chicago, as was stated when the speed reducer was originally described, (*AM*, Vol. 74, p. 484).

While a merger between the Dodge Manufacturing Company, Mishawaka, Ind., and Foote Bros. Gear & Machine Company, Chicago, is in negotiation, it is not yet an established fact. The organizations are still operating independently.

PATENTS

JULY 7, 1931

Metal-Working Machinery

Variable Speed Controller Mechanism. Benjamin P. Graves, Cranston, R. I., assigned to Brown & Sharpe Manufacturing Co. Patent 1,812,871.

Machine for Bending Sheet Metal Shapes. Albert Rafter, Belleville, N. J., assigned to Rafter Machine Co. Patent 1,812,982.

Indicator. John J. N. Van Hamersveld, Cleveland Heights, Ohio, assigned to The Warner & Swasey Co. Patent 1,813,002.

Control Gear. Walter Ferris, Milwaukee, Wis., assigned to Oilgear Co. Patent 1,813,040.

Machine for Forming Openings in Piping. Winford L. Enghauser, Cincinnati, Ohio. Patent 1,813,152.

Metal-Working Machine. Henry M. Lucas, Cleveland, Ohio, assigned to The Lucas Machine Tool Co. Patent 1,813,355.

Riveting Machine. John G. McClean, Chicago, Ill., assigned to the Grant Manufacturing and Machine Co. Patent 1,813,415.

Elbow Lathe. Howard Parker, Berlin, N. H., assigned to Brown Co. Patent 1,813,419.

Threading Device. Robert S. Brown, New Britain, Conn., assigned to the New Britain-Gridley Machine Co. Patent 1,813,480.

Turret Clamping Device. George M. Class, Madison, Wis., assigned to Gisholt Machine Co. Patent 1,813,484.

Grinding Machinery. George E. Merryweather, Cleveland Heights, Ohio, assigned to the Motch & Merryweather Machinery Co. Patent 1,813,503.

Machine for Grinding Saws. Emanuel Stauder, Rochester, N. Y., assigned to Huther Brothers Saw Manufacturing Co. Patent 1,813,825.

Tools and Attachments

Apparatus for Making Wheel Spiders. Irving H. Judd, Detroit, Mich., assigned to Whitehead & Kales Co. Patent 1,812,959.

Mold for Alumino-Thermic Welding of Rails. John H. Deppeler, Weehawken, N. J. Patent 1,813,032.

Adjustable Center for Rotary Speed Indicators and the Like. Benjamin L. Metzger, Toledo, Ohio. Patent 1,813,065.

Casting Ladle. Frank G. Carrington, Anniston, Ala., assigned to Ferric Engineering Co. Patent 1,813,381.

Screw-Thread Cutting Die. Arthur Harold Lloyd, Coventry, England. Patent 1,813,456.

Adjustable Machine Head. Raymond E. De Walt, Leola, Pa., assigned to De Walt Products Corporation. Patent 1,813,568.

Receding and Collapsing Tap for Threading Pipe Couplings. Charles P. Welmore, Milwaukee, Wis., assigned to A. O. Smith Corporation. Patent 1,813,594.

Wheel Dresser. Edward Augustus Shriver, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,813,682.

Screw Feeding Mechanism. Frank H. Dellaree, Detroit, Mich., assigned one-half to Roy W. Bailey. Patent 1,813,697.

Chuck. Arthur J. Lewis, Stratford, Conn., assigned to the Baird Machine Co. Patent 1,813,705.

Attachment for Drilling Machines or Drills. Charles Weber, Pearson, Wash. Patent 1,813,785.

JULY 14, 1931

Metal-Working Machinery

Machine for Bending Sheet Metal Shapes. Albert Rafter, Belleville, N. J., assigned to Albert Rafter and John C. Rafter, Jr. Patent 1,813,951.

Machine for Boring Cylinders. Charles B. Cole and Otto Leroy Lewis, Chicago, Ill. Patent 1,814,078.

Centerless Grinding Machine. Sol Einstein, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,814,209.

Machine for Making Pivot Pins. John Q. Holmes, Anderson, Ind., assigned to Delco-Remy Corporation. Patent 1,814,250.

Machine for Cutting Gear Teeth. William E. Sykes, Buffalo, N. Y. Patent 1,814,348.

Grinding Machinery. Frederick J. Theler, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,814,350, and 1,814,351.

Grinding Machinery. Clement Booth, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,814,361.

Centerless Grinding Machinery. Clement Booth, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,814,362.

Grinding Machinery. Clement Booth, Cincinnati, Ohio, assigned to the Cincinnati Grinders Incorporated. Patent 1,814,363.

Valve Grinder. Clement Booth, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,814,364.

Grinding Machinery. Clement Booth, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,814,365.

Long Bar Grinder. John E. Caster, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,814,367.

Molding Apparatus. John T. Stoney, Cleveland, Ohio, assigned to Raymond E. Stoney. Patent 1,814,416.

Grinding Machinery. John E. Caster, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,814,431.

Mechanical Hammer. Felix Tauriac, Jennings, La. Patent 1,814,459.

Apparatus for Widening Rolled Metal Products. Harvey M. Gersman, Buffalo, N. Y. Patent 1,814,594.

Riveting Machine. Frederick H. Rohr, San Diego, Calif., assigned to Solar Aircraft Co. Patent 1,814,632.

Power Cutter for Round Metal Objects. Frederic W. Erickson, Larchmont, N. Y. Patent 1,814,675.

Portable Boring Machine. Floyd S. Hartwell, Cleveland, Ohio. Patent 1,814,920.

Drill Arm for Metal Drilling Machinery. Albert E. Robinson, Cincinnati, and William L. Schellenbach, Wyoming, Ohio, assigned to The American Tool Works Co. Patent 1,814,963.

Grinder. John W. Smith, New Britain, Conn., assigned to The Fafnir Bearing Co. Patent 1,815,014.

Tools and Attachments

Tubing and Method of Forming the Same. Samuel W. Taylor, Detroit, Mich., assigned to Copeland Products, Incorporated. Patent 1,813,971.

Saw Filer's Gauge. Isaac D. Cantrell, Dallas, Tex. Patent 1,813,989.

Soldering Iron. Edward Jacobson, Winnipeg, Manitoba, Canada. Patent 1,814,041.

Inside Casing or Tool Joint Cutter. Robert A. Lincoln, Pampa, Tex., assigned one-half to the American Iron & Machine Works, Inc. Patent 1,814,048.

Internal Pipe Cutter. George V. Powers, Oklahoma City, Okla., assigned to American Iron & Machine Works, Inc. Patent 1,814,058.

Tool Carrying Head. Charles B. Cole and Otto Leroy Lewis, Chicago, Ill. Patent 1,814,079

Device for Use on Lathes or the Like. Wilbur E. Hayward, Los Nietos, Calif. Patent 1,814,087.

Tool Holder. Josef Garbarek, Walsum-on-the-Rhine, Germany. Patent 1,814,211.

Tool Supporting Arrangement. Floyd M. Williamson, Detroit, Mich. Patent 1,814,274.

Hopper Feed. George W. Binns, Cincinnati, Ohio, assigned to Cincinnati Grinders Incorporated. Patent 1,814,279.

Stamped Ratchet Die Head. Ralph E. Hyde, Cleveland, Ohio, assigned to the Oster Manufacturing Co. Patent 1,814,388.

Threading Die Holder. Harley D. Pennington, Pittsburgh, Pa., assigned to United Engineering & Foundry Co. Patent 1,814,492.

Wrench of Yielding and Adjustable Structure. Robert L. Cairncross, Chicago, Ill., and George H. Goodell, St. Paul, Minn., assigned to the National LockWasher Co. Patent 1,814,544.

Safety Mechanism for Cranes. Ralph Z. Hopkins and George T. Davey, Detroit, Mich., assigned to Hudson Motor Car Co. Patent 1,814,599.

Pressure Operated Sand Blast Valve. George A. Boesger, Cleveland, Ohio, assigned to The W. W. Sly Manufacturing Co. Patent 1,814,616.

Lathe Chuck. Minott P. Hubbell, Ashburnham, Mass. Patent 1,814,699.

Spinning Spindle. Friedrich Eisenlohr and Carl Uebelen, Stuttgart, Germany, assigned to Norma-Hoffmann Bearings Corporation. Patent 1,814,743.

Cutting Tool. Charles Neubauer, Bridgeport, Conn., assigned to The Armstrong Manufacturing Co. Patent 1,814,763.

Grinding Wheel and Holder. Hobart C. Beach, Covington, Ky., assigned to The Carborundum Co. Patent 1,814,782.

Bar Cutter. Reid A. Edwards, Albert Lea, Minn. Patent 1,814,790.

Cutting Die Structure. Christian A. Cadenbach, St. Louis, Mo., assigned to Independent Die & Supply Co. Patent 1,814,824.

Tool Holder. Joseph J. Zinslen, Canton, Ohio. Patent 1,814,882.

Boring Bar. Floyd S. Hartwell, Cleveland, Ohio, assigned to Kelly Reamer Co. Patent 1,814,919.

Boring Bar. Floyd S. Hartwell, Cleveland, Ohio. Patent 1,814,921.

Taper Boring Tool. Floyd S. Hartwell, Cleveland, Ohio. Patent 1,814,922.

Core Removing Device. Joseph Hourigan, New Kensington, Pa., assigned to Aluminum Company of America. Patent 1,814,928.

Tool Attachment for Lathes. William L. Schellenbach, Wyoming, Ohio, assigned to The American Tool Works Co. Patent 1,815,012.

Processes

Method of Soldering Chains, Chain-Mesh or the Like. Georg Brunhubner, Pforzheim, Germany, assigned to Ernst Gideon Bek, Pforzheim, Germany. Patent 1,813,904.

Method of Making Interlocking Elements from Sheet Material. Willard H. Cobb, Brooklyn, N. Y., assigned to The Shoe Hardware Co. Patent 1,814,244.

Process for Widening Rolled Metal Products. Harvey M. Gersman, Buffalo, N. Y. Patent 1,814,593.

Method of Preparing Metal Surfaces to Receive Permanent Coatings. Ralph Z. Hopkins and Albert E. Fellers, Detroit, and Oscar T. Coffelt, Grosse Pointe, Mich., assigned to Hudson Motor Car Co. Patent 1,814,600.

TRADE PUBLICATIONS

BEARINGS. The Wagner Electric Corporation, 6400 Plymouth Ave., St. Louis, Mo., has issued bulletin S-349 on steel-backed babbitt-lined bearings, which are use in its line of motors.

CAM AND GEAR CHARTS. The Millholland Sales & Engineering Co., P. O. Box 1622, Indianapolis, Ind., has issued a series of cam and gear charts and data sheets for its automatic drill units in order to simplify the calculations for changing the cams and gears on these machines.

CONTROL UNITS. The Allen-Bradley Co., 1311 So. First St., Milwaukee, Wis., has issued a complete set of new and revised bulletins and price sheets covering recent developments and improvements in a number of control units.

CONVEYING MACHINERY. The Fairfield Engineering Co., Marion, Ohio, has issued a catalog on standard and special elevating and conveying machinery, containing 100 pages and many blueprint installation diagrams.

GEAR CHAMFERING MACHINES. The City Machine & Tool Works, East Third at June, Dayton, Ohio, has issued a circular on the new Model 3 Peerless gear chamfering machine in the plain and universal types.

HACKSAW BLADES. The Armstrong-Blum Manufacturing Co., 333-357 North Francisco Ave., Chicago, Ill., is distributing a circular on its "Marvel" high-speed-edge hacksaw blades, featuring an electric weld integral at the base of the teeth.

LAMP CHARACTERISTICS CALCULATOR. The General Electric Co., Nela Park, Cleveland, Ohio, is distributing a combination celluloid and cardboard slide rule which quickly reveals the voltage operating characteristics of electric lamps, and affords a simple analysis of the economics of incandescent lighting.

CONTROLS. The Shallcross Control System Co., Milwaukee, Wis., has brought out a new loose-leaf catalog on the various controls for gases and liquids.

LATHES. The Western Machine Tool Works, Holland, Mich., has issued catalog No. 100 on Chard lathes, which are Timken-bearing equipped. The catalog contains 35 11x8½-in. pages, illustrating each type of lathe, the attachments, and various important assemblies.

MOTORS. The Ideal Electric & Manufacturing Co., Mansfield, Ohio, has issued bulletin No. 520 on synchronous motors.

NITRIDING PRICES. The Wesley Steel-Treating Co., Milwaukee, Wis., has prepared a celluloid data card containing list prices and data on nitriding. The card has a slide so arranged that by pulling out the tab the price per pound can be read for any number of pieces from 1 to 3,000 per lot, varying in weight from ¼ to 175 lb. per piece. The sequence of operations before and after nitriding is given, and the properties of nitrided pieces compared with casehardened pieces.

SPEED REDUCERS. The Horsburgh & Scott Co., 5114 Hamilton Ave., N. E., Cleveland, Ohio, has issued a speed reducer catalog, containing 128 pages, and a selection chart of a number of types of speed reducers.

SPEED REDUCERS. The W. A. Jones Foundry & Machine Co., 4401 West Roosevelt Road, Chicago, Ill., has issued a catalog on worm gear speed reducers, containing in particular a chapter on "Selecting the Correct Worm Gear Speed Reducer for the Job."

SHEET METAL WORKING TOOLS. The Niagara Machine & Tool Works, Buffalo, N. Y., has issued bulletin No. 78 on snips and hand tools for sheet metal working.

STEEL STOCK LISTS. The Jones & Laughlin Steel Corporation, 2250 West 47th Street, Chicago, Ill., has issued a combined stock list for the five warehouses at Chicago, Cincinnati, Louisville, New Orleans, Pittsburgh and Detroit, the list being effective for July, August and September, 1931.

TOOL STEEL. The Columbia Tool Steel Co., 112 W. Second St., Cincinnati Ohio, has issued a circular on "Oildie" non-shrinking tool steel, containing information on machining, forging, re-annealing, hardening, tempering and grinding.

WRENCHES. The Blackhawk Manufacturing Co., Milwaukee, Wis., has published a supplement to catalog P-130 on production sockets and drivers, conforming to the newly adopted G.M.C. Socket Wrench Standards.

AMERICAN MACHINIST

Editors: KENNETH H. CONDIT AND FRED H. COLVIN

New York, July 23, 1931

VOL. 75 NO. 4

Tolerances and Shop Costs

Economy of manufacture depends to a considerable extent on the accuracy specified on the blueprints. Setting tolerances finer than necessary adds to the cost of a product, but in some cases at least the engineering department tries to play safe by specifying half thousandths where several times this would answer equally well.

One large concern has set up a standard increment for tolerances instead of letting the designer specify anything he desires. These tolerances begin at two-tenths and increase by geometrical progression such as four, eight, sixteen and so on. No tolerances between these can be specified, which simplifies the practice for both drafting room and shop. In this concern practically all the tolerances are set by one man who was trained for the work, because determining tolerances that will be close enough for the desired accuracy, and yet not too costly to produce, is a real job that requires keen judgment.

Simplifying Patent Procedure

The old phrase "A patent is merely an invitation to a lawsuit" has just enough truth in it to warrant a concerted effort to change the federal court structure that is largely responsible for the difficulty.

In a clear exposition of the situation, Edwin J. Prindle, New York, patent expert, points out the confusion resulting from the existence of ten Circuit Courts of Appeal throughout the country, each of which can interpret a patent appeal case as narrowly or as broadly as it chooses. In one district the court may find for the plaintiff, in some other district the corresponding court may find for the defendant. Only when this happens, generally speaking, will the United States Supreme Court take notice of the case. And, in any event, it is likely to be several years before a decision is handed down in the Circuit Court. More than five years elapsed between the conclusion of testimony and the rendering of the decision in a recent case in the machinery field.

The proposal of Mr. Prindle is to establish a Court of Patent Appeals, at Washington, to rank just below the Supreme Court, its judges to hold office "during good behavior," as do the Supreme Court justices. This one court would exercise the functions of the ten Circuit Courts of Appeals, in patent cases, and would act far more quickly. Also, its judges would naturally be expert in patent law and engineering practice, and its decisions would consequently be more truly just.

A bill embodying this proposal will be offered when the next Congress meets. Action may not be immediate. This proposal was first made thirty years ago and has been agitated periodically ever since. And there is nothing harder to modify than the traditions of our courts. According to former attorney general Wickersham there has been but one major change in civil court procedure in one hundred and fifty years, and no major change in criminal court procedure. Hence, what effort there is in favor of the bill must be coordinated and intelligently directed.

Unemployment Relief

Two vitally important tasks face every community, industry and company now: planning for the relief of unemployment during the coming winter, and long-time planning to cope with unemployment in the future. The New England Council at its recent council meeting passed a resolution recognizing the necessity of such planning, thus establishing even more

firmly its record for progressive thought and action.

Splendid work has been done by the Council's Industrial Committee under the leadership of James W. Hook. Its recommendations formed the basis for the resolution referred to. They are of sufficient merit to warrant study by every employer in the country. They are as follows:

"1. That it is the obligation of business to initiate and pursue such policies and practices as will make governmental intervention unnecessary in matters which business should handle for and by itself.

"2. That the current depression has demonstrated the need for the formulation of plans by management to provide for stability of employment more adequately in the future than in the past.

"3. That such plans should aim at continuity of employment for the stable forces, as determined by each employer, and should include provision for making the plans effective."

By the first of January the process of industrial recovery may have advanced to the point where unemployment is no longer a problem; but it will be wise to be prepared for what may await us if this happy state is not quite reached. The Hook committee recommendations offer at least a starting point for individual planning.

◂◂ CHIPS ▸▸

Affability apparently superseding suspicion in diplomatic and financial conferences of Western Europe. . . . American attendance at London marks sharp change in international attitude, presages fireworks when Congress meets. . . . Machinery manufacturers here are wondering how Germany manages to guarantee large proportion of credit for exports of machines in view of the financial difficulties only too painfully evident. . . . France seems to have similar question about "pocket battleships."

President's Emergency Committee for Employment is mobilizing resources of relief associations to cope with distress that is generally most acute after bottom of depression has been passed.

Department of labor reports 6.5 per cent drop in cost of living since January, food leading other factors at 13.8 per cent. . . . Helpful for those who have jobs, but not much consolation to the unemployed. . . . Requesting of bids on ten destroyers, authorized in 1916, money appropriated at last session of Congress, will mean work for many men in metal trades.

McMillan Committee in England recommends protective tariff policy, condemns wage cutting as more than offsetting any savings in production costs, believes that central bank can manage price levels.

PSYCHING A SALESMAN

When three metal product companies merged recently, some bright master mind hit upon the idea of psycho-analyzing the executives and salesmen of the three groups to find out if there were any misfits. It was discovered that one better-than-average salesman had always harbored a secret yearning for research work. He was shifted to the laboratory and is now happy as a lark. Possibly a similar study of many a salesman would discover strange yearnings in these troublous times.

Lumber and standard cotton cloth orders exceeded production in June. . . . Fisher's business index rose from 82 to 86.1, last week. . . . Increases over corresponding periods of 1930 in air mail poundage, production of boots and shoes, Auburn automobile earnings, General Motors and Studebaker sales, cotton exports, General tire sales, canned salmon, Frigidaire production, electrical energy produced in Atlantic Seaboard plants are of record.

Large corporations interested in Latin-American trade consider formation of cooperative organization to stimulate development of natural resources, aid in establishment of progressive business methods.

LETTING THE SHOP GO FISHING

One of our old friends, head of a big machine concern, made a startling proposition the other day. "Business," he said, "is not only poor but exasperating. We waste a lot of time over a little mail and get peevish all down the line. I have been thinking a lot lately about the old days on the farm. Whenever we had the work done in the fall we all took it easy for awhile and fished or hunted. I've a good notion to shut the shop for two months, pay everyone his wages out of surplus, and then come back and get busy. We earned big money before the slump. The

whole shop helped; I'm not so sure it wouldn't be the quickest way to get things back to normal."

Some splendid entries in the contest for the *American Machinist* Awards are lining up. See the questions and answers on page 192g if you are going to enter. May save you time and effort.

International Tel. & Tel. announces a telephone conversation recorder. . . . It consists of a magnetic steel wire on which the remarks of both parties are recorded. . . . No other data have been released, but production is to begin at once.

SERVICE AND REWARD

To save their economic skins the railroads are petitioning the I.C.C. for a blanket rate increase. Possibly they well deserve it, but in the minds of many of us there is a lingering doubt. Have the railroad executives really done everything they possibly can to adapt their service to modern conditions? Some of us know that they have an unduly large proportion of obsolete and consequently wasteful locomotives running around, and those of us who travel very much have our own ideas of the kind of service offered on some lines.

Contrast these mental reservations with the impression one gets from the recent announcement of twelve-hour freight service between New York and Portland, Maine, a service so good that it is better than first class mail service between these cities. Here is a real transportation service, one that will stump the competing transportation facilities. If railroad service in general were susceptible to as much improvement there would be freight in volume sufficient to make a plea for increased rates probably unnecessary.

Mississippi barge lines are taking business from the railroads, showed a profit for first 5 months of 1931. . . . I.C.C. authorizes increase in size of parcel post packages from 84 to 100 inches, length plus girth, and the 70-lb. weight limit of the first 3 zones is extended to distant zones formerly limited to 50 lb. Machinery builders should find the change advantageous in shipping repair parts.

THIS WEEK AND NEXT—IN *AM*

Airplanes are bulky things, orders fluctuate widely. How these divergent factors were reconciled is the subject of the first article this week, concluded next week. Shall heat treating be concentrated or shall the necessary equipment be sandwiched into the production line at appropriate points? At Schenectady G.E. there is a centralized set-up (page 162).

Good gaging is essential. There are three articles in these two issues, parts II and III of Harry Shaw's series on multi-point gages, and one on a recording contour gage, this week (page 167).

Next week the first article deals with the economics of the small shop, there is an article giving the latest developments in the deLavaud process of casting pipe centrifugally, a largely mechanized foundry process, and the first of two spreads illustrating the Chrysler cylinder line-up. Chrysler, by the way, is adding 30,000 square feet to one of his plants.

• MEETINGS •

THE INDUSTRIAL INSTITUTE
Silver Bay on Lake George, N. Y., Aug. 10-25, Charles R. Towson, secretary, 347 Madison Ave., New York, N. Y.

NATIONAL METAL CONGRESS AND EXPOSITION
Exposition on Commonwealth Pier, and Congress sessions at Hotel Statler, Boston, Mass., week of Sept. 21. Information from W. H. Eisenman, Secretary A.S.S.T., 7016 Euclid Ave., Cleveland, Ohio.

SOCIETY OF AUTOMOTIVE ENGINEERS
National Production meeting, Detroit, Mich., Oct. 7-8. Headquarters, 29 West 39th St., New York, N. Y.

NATIONAL SAFETY COUNCIL
20th Annual Safety Congress, Chicago, Oct. 12-16. Civic Opera Bldg., Chicago.

SOCIETY OF AUTOMOTIVE ENGINEERS
National Transportation meeting, Washington, D. C., Oct. 27-29. Headquarters, 29 West 30th St., N. Y. C.

AMERICAN MANAGEMENT ASSOCIATION
Annual Convention, New York, N. Y., Nov. 17-19, devoted to the general theme of Coordinated Industrial Planning. Headquarters, 20 Vesey St., New York, N. Y.

AMERICAN MANAGEMENT ASSOCIATION
Industrial Marketing Conference, Hotel Statler, Cleveland, Ohio, Oct. 21-23. Headquarters, 20 Vesey St., New York, N. Y.

INTERNATIONAL INDUSTRIAL RELATIONS CONGRESS
To be held at Amsterdam, Holland, Aug. 23-29. Information from Mary van Kleeck, Russell Sage Foundation Building, New York, N. Y.

INTERNATIONAL CONGRESS FOR TESTING MATERIALS
First Congress of the new International Association for the Testing of Materials, Sept. 6-12, buildings of the Swiss Federal Polytechnicum, Zurich, Switzerland. C. L. Warwick, secretary-treasurer, American Society or W. H. Fulweiler, A.S.T.M. Representative on the permanent committee, chemical engineer of the United for Testing Materials, 1315 Spruce St., Philadelphia; Gas Improvement Co., Philadelphia.

Progress in Metal-Working and Machinery Markets

GOOD PROSPECTS but poor sales characterize the week's machinery and machine tool markets. Most alive of business prospects are automotive model changes. Other industries still lag, and school demand, ordinarily considered a negligible item, finds prominence in reports from many centers. Demand for used tools duplicates that for new. N.M.T.B.A. indices dropped off in June, the index of orders going from 87.2 to 73.6. Middle-size companies suffered a 39 per cent drop, largest size but 9 per cent, smallest size 16 per cent.

NEW YORK has one dealer at least with slightly better July business, and some Government inquiries. San Francisco likewise is depending upon Government and school business to pay rent bills, while industrial sales are expected this winter to follow a present increase in inquiry. Chicago has new industrial inquiry for automatic screw machines and grinding machines, and International Harvester and the Santa Fé have not yet closed their lists. Indianapolis also reports an upturn in inquiries, although school business retains the center of a slow market.

DETROIT considers automobile production has passed its low point, being ahead of the figure for a similar period of last year. Machine tool dealers confidently expect steadily increasing business as a result of the new model changes. Meanwhile, the market there and in Canada is slow. Canada, however, has fair demand in electrical supplies, hydraulic and mining machinery, and lumbering and aeronautical equipment, which may mean tool business shortly. New England reports spotty improvement, with Government and Soviet possibilities leading. Cincinnati expects to hold even, having an order here and there, but no immediate upturn is contemplated.

NEW YORK

No change is discernible in the low ebb which has obtained for several weeks in the local market. One dealer reported slightly better business so far this month than for a comparable period last month. But this was only one cry in the wilderness. Inquiries are dull, with the exception of a few from the Government. Most dealers expect better business in the fall, but none will swear to it if cornered.

SAN FRANCISCO

Inquiry among several of the machine tool houses reveals that government and school orders continue to predominate and are about up to standard, as schools are now busy preparing for the fall semester. Industrial orders continue to fall far short of what is desired and has been anticipated. However, some optimists forecast increased sales by the middle of winter as several encouraging inquiries have been received recently and considerable small business is in the offing. Shop supplies are reported as moving satisfactorily. Road-making machinery seems to have made some gain during the past month.

CHICAGO

Although no indications of an upward trend were noted during the last week, a more hopeful feeling regarding the future is evident. This, in part, may be the result of new industrial inquiry for some lines in which no interest has been shown for several months. Among these are automatic screw machines and grinding machines. A few executives now express the belief that by September or October a more active demand will obtain. The International Harvester Co. is reported to be in the market for some items not included in the list closed a few weeks ago. With the exception of the Santa Fé, which still has some units outstanding, western railroads are said to have bought against practically all items for which inquiries have been made. Demand for used tools continues negligible.

INDIANAPOLIS

While business continues to struggle along at a low ebb, there are well defined indications of a turn for the better. The last two weeks show increased inquiries and some orders have resulted, particularly from school corporations.

Buying from other sources was very much restricted. The railroad demand has been off the entire year and present indications are discouraging. Little buying has been reported by the iron and steel industry. The demand for special equipment on the part of the sand and gravel industries has been good, but most of them are through buying for the remainder of the year.

Contractors' equipment has not gone so well this year. A fair volume of small machinery is going to garages.

DETROIT

Automobile production has passed its low point, most of the plants turning out more cars in June than they did in June, 1930, and it is generally believed that production in succeeding months will top that of corresponding periods last year. Machine-tool dealers are accordingly looking toward a gradual increase in business during the coming months, and several report gains in activity since July 1. It is now definitely assured that changes in a number of standard, medium-price class motorcar models will be even more extensive than first reported.

Meanwhile Detroit is struggling along in the throes of enforced economy. Employment index for June 30 was 73.2 compared with 74.8 on June 15 and 80.4 on May 31.

CANADA

The market for machinery and machine tools in Canada is pretty well mixed at present. Agricultural implement and machinery demand is poor; railway equipment orders are practically at a standstill; construction machinery is dull, with contractors favoring rented equipment, and demand for automotive supplies is off considerably when compared with the last two months. On the other hand, a fair business still prevails in electrical supplies and hydraulic equipment, and also in mining machinery and equipment. Lumbering conditions are gradually improving, with a resultant increase in orders for machinery, and there is some improvement in the call for aeronautical equipment.

NEW ENGLAND

Sales of the current week were of no outstanding importance. Mid-summer finds industry at a generally low level, which is, however, fairly well sustained. Spotty improvement in specific districts has tended to increase optimism among machinery officials who anticipate substantial gains by September. The outlook just now indicates machine-tool orders from the government will be placed soon. Russian agents are still active in this section, but no new orders have been reported. Small tool sales are only fair.

CINCINNATI

Business continues at the bottom, with no important ups or downs. Agents are getting an order here and there and are having some success in developing prospects. The nature and volume of the past week's business remained very much as it has been, with an occasional order for two or three tools. Because of the number and nature of the inquiries received, it is judged that no further recession is imminent, but there is little or no expectancy of immediate increased demand.

WEEK . BY . WEEK

BUSINESS BAROMETER

Trends in General Business throughout the world

THEODORE H. PRICE
Editor, Commerce and Finance, New York

With wheat selling at 25 cents a bushel in Kansas, and the suspension of some of the more important banks in Germany and Austria, it is difficult to say whether the financial debacle which seems to have overtaken Europe is approaching this country or departing from it.

In a financial sense we are now so entangled with Europe that everything which happens overseas reacts upon us, but our investment in France and Germany is not yet sufficiently heavy to paralyze all of the machinery of credit when part of it is out of adjustment. The reparation payments which have been expected in some quarters have never been dealt with as a marketable asset, and even if they are not collected we should not greatly miss the payments that we are scheduled to receive during the next fifty-odd years. Therefore, the question over which the European financiers are so much agitated is for us more or less of an abstraction, and we will not be greatly affected even though it be decided against us.

But the dollars and cents aspect of the matter is less important than the effect it may have upon national and international sentiment and the possibility of war that is inherent in a situation which is already causing so much irritation.

Hope Brightens

Hope that a way out of the international financial impasse will be found has been brightened by the welcome news that Secretaries Stimson and Mellon will participate as full-fledged representatives of the United States Government in a conference of Cabinet Ministers called by Great Britain which meets in London on Monday, and that international politics, economics, reparations, war debts, the Hoover moratorium plan and disarmament will be the subjects discussed in an effort to bring ancient enemies to a mutual understanding and reconciliation. It is to be hoped that this will mark the end of the undignified "unofficial observer" stage of our foreign diplomacy and that our voice will hereafter be heard openly in international councils when and as it may be needed.

Stocks and bonds, sterling and mark exchange, celebrated the news by making appreciable advances, and wheat, cotton and several other commodities followed suit. The lesson should not be lost on the statesmen of the world that the distress in the various countries has been and is in no small degree the result of their petty squabbling for national advantage, while all that business really needs anywhere is fair play. If the conference results in an amicable composition of the issues, all may yet be well.

In the face of a situation whose discouraging aspects are so generally known and admitted it seems unnecessary to particularize. The cloud of financial mistrust which hangs over Europe has been exhaustively depicted in the cables published in American papers. There is, in fact, some reason to believe that the pessimistic conditions which prevail overseas have been exaggerated in the interest of the would-be European borrowers, who seem to be trying to find an open sesame to America's reserve of wealth, the method of the politicians and financiers of Europe, skilled in the art of negotiating loans, being to "throw a scare" into the would-be lender.

Better Understanding

There may be something of this in the cables that have been provided for American consumption, but it has not worked thus far, and it may be that its effect will be to bring about a better understanding between the powers parading their antagonisms and appearing to be eager to create an economic or political situation that would bring them to the brink of war.

In dealing with a situation that is so inclusive, it is hardly necessary, and would be impossible, to discuss details. All we can do is to hope that the experience of the last great war will make men realize the danger of fooling with a loaded gun, and lead them to consider the things that make for peace and righteousness rather than for war.

If it were not that many have now come to fear that some of the world's greatest nations may again attempt suicide, we would probably find ourselves in the midst of the greatest business revival ever known. All the essentials of such a revival are here. Cheap money, abundant credit, adequate labor, eagerness to work, and an improved understanding of economic law are to be observed throughout the English-speaking world. The people of that world conduct or control nearly three-fourths of its international trade. Unrestrained, and with a little encouragement, this English-speaking portion of the population is ready and anxious to embrace the many opportunities that have been revealed by the war, and the developments which have followed it.

While there has been much talk of another war, those who discuss it put it five or ten years ahead. In this fact safety is to be found, for there are not many men who are now ready to prepare for a war that will not be declared until 1936. Therefore, the present fear or worship of the gods of war had better be abandoned while men are being taught how to practice the arts of peace, and enjoy the prosperity that they bring.

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THE BUSINESS WEEK

July 22, 1931

Whirlwinds of worried words from financial and political storm centers of Europe sweeping across front pages and swirling through world securities markets have obscured the slight signs of strengthening in basic business indicators in these self-sufficient States during the past two weeks. . . . In face of frightening foreign financial news and the full force of summer slackness, our index has recovered from its slight slump at the end of June to a level in line with the average of the past six months. . . . Concealed currents of deferred demand in consumer industries are undoubtedly sustaining and stimulating domestic business despite foreign difficulties. . . . The steadiness of domestic securities in the home market is another encouraging sign of resistance of American psychology to panic possibilities, and the passing of the damn-fool stage of this depression. . . . Record low wheat prices are largely a reflection of political factors interfering with normal market forces. . . . Uncontrolled commodities continued to fluctuate around the levels established in June. . . . Meanwhile the merry music of the moratorium march from the banks of Berlin to the plains of Kansas sounds the dirge of deflation. . . . When deflation drives debtors to default, creditors become moratorium minded and expansion is inevitable. . . . All signs point imperatively in that direction and focus the attention of world finance on Federal Reserve policy.

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Material Trends and Prices . . . .

The only price changes of note are a clear sweep downward in non-ferrous metals for the metallurgical trade. Demand in this market has been exceptionally small for the last two weeks. Iron and steel market continues quiet with prices unchanged.

(All prices as of July 17, 1931)

IRON AND STEEL

Pig Iron—	Current	Mo. Ago	Yr. Ago
Birmingham, No. 2, Fdry., per gross ton	$12.00	$12@13	$14.00
Buffalo, No. 2, Fdry., per gross ton	17.00	19.91@20.41	16.20
Heavy Melting Steel Scrap— Pittsburgh consuming point, No. 1, per gross ton	9.50	10.00	14.75
Furnace Coke—Connellsville, per net ton	2.75	2.40	2.50
Foundry Coke—Connellsville, per net ton	3.50@4.25	3.25	3.50
Steel Shapes—Pittsburgh, base, per 100 lb	1.65	1.65	1.65

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Iron Machinery Castings—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight, 275 lb.:

Chicago . . . . . 4.62½ Cleveland . . . . . 4.75 New York 4.75
Cincinnati . . . . . 4.40 Detroit 4.00

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Steel Sheets—Prices in cents per lb., del. from warehouse stock (except at Pittsburgh) in lots of 401 to 999 lb., ordered and released for shipment at one time:

	Pitts. Mill	Chicago	Cleveland	New York
Blue annealed, No. 10*	1.85	3.20	3.00	3.40⅞
Black sheets, No. 24	2.40	3.55	3.60	3.50
Galvanized, No. 24	2.90	4.10	4.00	4.00

* Light plates.

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Seamless Steel Tubing—Cold-drawn mechanical tubing, round, .10 to .30 carbon, in lots of less than 100 ft. or 100 lb., net, at N. Y. warehouse:

Thickness of Wall	Outside Dia. in Inches						
	½	⅝	¾	⅞	1	1¼	1¼
Inches	B.w.g.	Price per Foot					
.035	20	$0.15	$0.16	$0.17	$0.18	$0.19	$0.21	$0.23

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Shapes, Plates, Bars, Etc.—Warehouse base prices in cents per lb., del. in lots of 401 to 999 lb., ordered and released for shipment at one time:

	New York	Cleveland	Chicago
Bands	3.40	3.20	2.95
Bars, soft steel	3.10	2.95	2.75
Cold fin., flat or square	3.90	3.90	3.60
Cold fin., round or hexagon	3.40	3.40	3.10
Cold rolled strips	4.95	6.00	5.50
Floor plates	4.85	5.00	5.00
Hoops	3.75	4.00	3.50
Rivets	4.00	4.00	4.00
Shapes	3.10	2.95	3.00
Spring steel	4.00	4.00	4.00
Tank plates	3.10	2.90	3.00

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Stainless Steel—Hot-rolled bars, base, Pitts., cents per lb.:

Chromium, 15%, carbon 0.12% and under	19.00
Chromium, 15 to 18%, carbon 0.12% and under	20.50
Chromium, 18 to 23%, carbon 0.12% and under	23.00
Chromium, 23 to 30%, carbon 0.12% and under	28.00

Bolts and Nuts—Discount from list, f.o.b. mills, Birmingham, Chicago, Cleveland and Pittsburgh, on machine bolts, all sizes, cut thread; nuts, hot-pressed or cold punched; and lag screws, mill lots . . . . . 73@10%

NON-FERROUS METALS

Prices following are in cents per lb. for mill shipments in carlots:

Aluminum ingots, 99%, N. Y.	22.60
Copper, electrolytic, Conn	7.75
Copper wire, base, Chicago and Cleveland	10.00
Copper wire, base, N. Y.	9.78
Lead, pigs, E. St. Louis	4.22½
Tin, Straits, pigs, spot, N. Y.	25.50
Zinc, slabs, E. St. Louis	3.90

Prices following are in cents per lb., base, N. Y., Chi. and Cleve:

Brass rods, high	13.75
Brass sheets, high	15.50
Brass tubing, high	20.37½
Copper, drawn round	16.37½
Copper sheets	17.87½
Copper tubing	20.37½

Prices following are in cents per lb., del. from N. Y. warehouse:

Babbitt, anti-friction, general service	28.50
Babbitt, com'l, intermediate grade	34.00
Babbitt, genuine, highest grade	45.00
Solder, bar	19.37½

Prices following are in cents per lb., base, Huntington, W. Va:

Monel metal rods, hot rolled	35.00
Monel metal sheets, full finished	42.00
Monel metal tubing, seamless	65.00
Nickel rods, hot rolled	45.00
Nickel sheets, full finished	52.00
Nickel tubing, seamless	75.00

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Scrap Non-Ferrous Metals—Dealers' purchasing prices in cents per lb., f.o.b. cars:

	New York	Cleveland	Chicago
Heavy yellow brass	3.25	4.25	4.00@4.25
Light brass	2.25	3.25	3.25@3.75
No. 1 rod-brass turnings	4.00	4.50	4.00@4.50
Heavy copper	6.12½	7.00	6.25@6.75
Light copper	5.12½	6.00	5.50@6.00

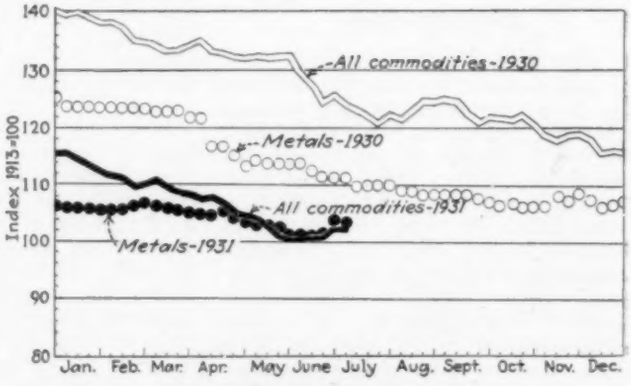
SHOP SUPPLIES

(Prices at warehouse)	New York	Cleveland	Chicago
Abrasive disks, aluminum oxide mineral, cloth, 6-in. dia., No. 1, less than 200, per 100	$4.36	$4.59	$4.59
Belting, leather, heavy, discount	30@10%	30–5%	40%
Belting, rubber, trans., 1st grade, discount	60–10–10%	50–10%	60%

Lumber—Per M ft., b.m., 16 ft. lengths, del., N. Y.:

Crating—Southern pine:
1x4-in. . . . . $25.00 1x6-in. $28.00

Skids—Spruce:
2x4-in. . $40.00 3x3-in. . $40.00 4x6-in. . $42.00 6x6-in. . $52.50



Price Indexes Week by Week
(6 Metals and 74 Commodities—Figures from The Annalist.)

American Machinist Awards for 1931

Since the Awards were announced on May 14, 1931, numerous questions have very naturally been raised and answered from time to time. It is hoped that the following condensed list of questions and answers may be of real assistance to those who are contemplating or preparing their entries in the contest

Q. What is the real purpose behind the Awards?

A. The purpose is two-fold: to discover, if possible, an adequate and proved replacement policy which may be adopted universally in the metal-working industry; to honor and reward the corporation whose executives thought forward, developed, and installed the prize plan for 1931.

Q. Why are there two Awards and why are the prizes the same?

A. There are two identical awards because executives have long since recognized that the solution of the replacement problem in a small shop may likely differ from that in a large one. If such be the case, it would be difficult indeed to differentiate between the net values of the plans themselves, though the net financial return from the one might very greatly overshadow that from the other.

Q. Specifically, just what will my company get if it wins one of the awards?

A. 1. A solid cast bronze plaque suitable for hanging in the offices or the lobby of the winner.

2. A Certificate of Award fittingly inscribed and signed by the Judges.

3. A purse of five hundred dollars to be held by the winner or divided among certain of its employees as designated by its officers.

4. A large measure of public recognition.

Q. Some contests and awards are won by fancy covers and decorative typography. How about it?

A. The conditions of the contest are specific on this point. "To hold down the expense of preparing briefs, decorative art work should be avoided. A typewritten statement (double spaced) that sets forth the facts as concisely as possible, but which contains all the essential details, will be adequate."

Q. Why is it desirable to notify the Chairman of the Committee in advance of submitting our brief?

A. To permit the Judges to plan their meetings. Messrs. Kimball, Coes, Shibley, Condit, and Dr. Klein are all men of large affairs, serving on the Committee at distinct sacrifices to themselves and to their principals.

Q. May I file an individual brief outlining a replacement policy which will undoubtedly be successful if it is adopted by any company? We have no definite policy as yet.

A. Unfortunately, no. It was decided that the present calls for concrete actualities—going plans that have proved their worth in practice. Another year may call for another objective, but not this year.

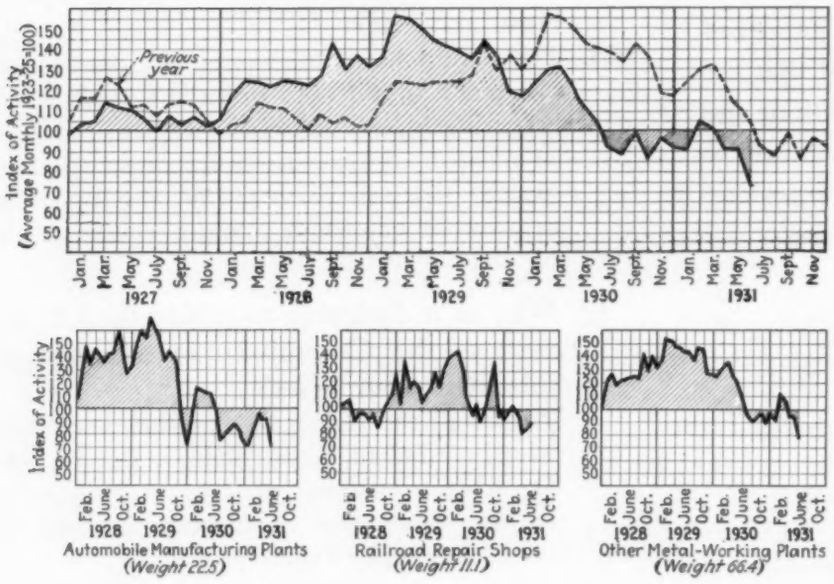
Q. Are photographs essential?

A. Not necessarily, but they are to be recommended. As the old proverb says, "A picture can tell more than a thousand words."

Q. Can the time for filing briefs be extended? September 1, 1931, is just around the corner.

A. No. The month of August alone should give you plenty of time to assemble your data, to reduce your replacement policy to words, to detail the results you have accomplished and to take any necessary photographs. Read "Conditions and Suggestions" in the May 14, 1931 announcement carefully, notify the Chairman of your intentions, and GET BUSY.

NEWS



June Metal-Working Operations Show Sharp Decline

Sharp declines in all activities, except the railroad repair shop field, were experienced in June, as indicated by reports on the consumption of electrical energy for power purposes. The final figure of 100.3 in March, 92.4 in April, and 92.6 in May, dropped sharply to 78.2 in June. These figures and subsequent ones are corrected for 26 working days.

The automobile shop index, given as 94.1 for March, 90.8 for April, and 91.5 for May, shows an unseasonal decline to 71.3 for June. The railroad repair shop index is given as 94.3 for March, 82.8 for April, 84.7 for May and 89.2 for June, an unexplained rise. Ferrous and non-ferrous metal-working plants outside these two groups have a June index of 78.6, a marked decline from the May index of 94.1. Figures for March were 103.5 and for April, 94.6.

When the figures are adjusted seasonally, slight revisions occur. In this respect it may be said that the average decline for June is about 5 per cent on a seasonal basis and is in line with other industries for a period of eight years. The railroad repair shop index rises to 96 from 89.2 as compared with 82.5 in May, 80.1 in April, and 90.3 in March. The automobile figure drops to 69.8 from 71.3, as compared with 78 in May, 76 in April, and 88.2 in March. The "other metal-working" figure rises to 82.8 from 78.6, as compared to 91.7 in May, 92.4 in April and 95.3 in March. These give a seasonally adjusted figure for the entire group of 81.4, as compared to 87.3 in May, 87.9 in April, and 92.9 in March.

Silver Bay Conference for Smaller Industries

The Conference of Smaller Industries, to be held at Silver Bay, Lake George, N. Y., Aug. 10-15, under the auspices of the National Industrial Conference Board, Inc., will provide executives of small plants an opportunity to meet and study jointly a number of important industrial problems. There are 193,562 manufacturing plants in the United States that normally employ 500 or fewer laborers, as compared with 2,747 establishments that employ more than that number. In spite of the preponderance of the small plants, the industrial problems are usually discussed from the angle of the large plants, notwithstanding that more than 60 per cent of all industrial labor is employed in the smaller plants. All addresses and discussions will be from the point of view of small plants.

Extending from Monday to Friday inclusive, the program will present 29 papers by as many leaders in their respective fields. The first day will consider: the small plant's place in American industry; its responsibility in economic and social progress; its relationship to the trade association; wage and price movements; industrial statistics, and recent knowledge gained by industrial management. The broad main headings for the succeeding days cover: "The Possibilities of Planning and Budgeting in the Smaller Plant"; "Scientific Management Applied to Small Plant Operation"; "The Problem of Determining Costs in the Smaller Plant"; "Personnel Relations in the Smaller Plant"; "Working Toward Greater Stabilization"; "The Safety Problem of the Smaller Plant"; "Sales Problems of Smaller Plants," and last, "Developing Latent Resources."

Federal Vocational Training Study Ready Soon

DR. J. C. WRIGHT, director of the Federal Board for Vocational Education, is confident that vocational training can be utilized to relieve unemployment caused by the introduction of new machinery and mechanical processing in industry. Dr. Wright is a member of Secretary of Labor Doak's committee on technological unemployment.

DR. CHARLES A. PROSSER, of Dunwoody Institute, chairman of the committee appointed in May, is expected to return to Washington about August 15. It is probable that the committee will remain in continuous session from that date until its report to Secretary Doak is completed. In the meantime, L. W. WALLACE, executive secretary of the American Engineering Council and a member of the Prosser committee, is contracting with industrial and trade organizations for the purpose of obtaining their cooperation in extending the statistical services of the U. S. Bureau of Labor Statistics to provide an adequate and continuous measure of the trend of employment as affected by advances in technology.

Business Recovery Indicated by Leipzig Fair

Widespread business recovery is indicated by the variety of exhibits offered by the nations which will attend the Leipzig Trade Fair this coming fall. This fair, approaching its 700th anniversary, has long served as a barometer of world business conditions and tendencies. This year it will attract 180,000 buyers from 72 countries, including 1,500 from all parts of the United States, which will be represented by 200 exhibits. The fair will be held from Aug. 30 to Sept. 3.

Activities of the German Machinery Association

BY OUR BERLIN CORRESPONDENT

The acknowledged advocate and representative of the German machinery industry is the "Verein Deutscher Maschinenbauanstalten" (V D M A), founded in 1892 and located in Berlin since 1914. In the course of time, the VDMA has developed into one of the most important German economic associations, and, considering both the works directly associated, as well as those who are members in its more specialized sub-combines, it includes about 2,200 firms. These include almost without exception all the larger machinery and appliance works in Germany, as well as the greater part of the medium-sized and smaller ones. With due consideration of the wide divergence of products manufactured by its members, these have been grouped in 13 classes:

1. Machine tools and small tools.
2. Textile machinery.
3. Agricultural machinery and implements.
4. Locomotives.
5. Engines.
6. Wood-working machinery.
7. Machinery and equipment for foundries, steel works, and rolling mills.
8. Mechanical conveyors (cranes, elevators, hoisting machinery, etc.), and scales.
9. Machinery for paper and graphical industries.
10. Machinery for food and chemical industries.
11. Crushing and dressing machinery.
12. Special machinery and parts.
13. Appliances.

Regarding the activities of the VDMA, the following points are of particular interest. The VDMA seeks to inform and enlighten the German government and the people's representation, as well as the public opinion at home and abroad, as to the conditions and essential requirements of the machinery industry regarding legislation and economics. Furthermore, the organization renders an important service by its extensive economic studies and investigations, as well as statistical work. In contrast to the United States, where such work is taken care of by the government (U. S. Department of Commerce), the VDMA has established production statistics of its own for the German machinery industry. Current statistical publications are: the monthly "Berichte über die Wirtschaftslage in der Maschinenindustrie" (Reports on the Economic Situation of the Machinery Industry); the "Statistisches Handbuch des deutschen Maschinenbaues" (Statistic Manual of the German Machinery Industry), which appears quarterly and, in concise form, contains statistical matter of most importance to the German machinery and appliances industry; further, semi-monthly statistical reports which save the executives of machine works the trouble of regularly following up numerous other publications, and are also supposed to aid them in studying the general economic situation as well as that of their particular branch. Since the beginning of 1929 the VDMA has published the economic section of the journal "Maschinenbau" as a special supplement to the technical part published by the "Verein deutscher Ingenieure" (VDI). In this independent economic section problems pertaining to the machinery industry, as well as to general economics, are treated. On specially important economic problems the VDMA expresses its opinion in bulletins, in which economic respect of the German machinery industry is scientifically analyzed and proved in detail. In this connection the bulletin "Die Maschinenindustrie der Welt" (The World's Machinery Industry), published in 1927 by the International Economics Conference, is worthy of mention.

In conformity with the great importance of foreign markets for the sale of German machinery, the revision of export trading problems constitutes a large part of the VDMA's activities. The secretary's office supplies members with information about German as well as foreign custom tariffs and custom laws, about consulates, and about various regulations concerning samples, shipping and forwarding and foreign exchange. Furthermore, the VDMA handles all such inquiries as regarding sources of supply and the dispatch of mechanics to foreign countries. By taking advantage of this information service the members save vast sums every year by avoiding custom disputes, duty amendments and estimates involving a loss. Still another important part of the activities consists of the representation of the interests of the machinery industry at negotiations for settling commercial treaties, at fairs and exhibitions.

The promotion of sensible foreign trade policies also belong to the tasks of the VDMA. Although during the World War it carried through the state's supervision of exports and imports for a long time with the aid of its branch combines, after the return of orderly economic and political conditions, it interceded for an early abolition of the import prohibitions on machinery.

Whereas the VDMA as a whole pursues economic problems of general interest, the treatment of more specialized economic affairs pertaining to the different branches of the machinery industry belongs to the working sphere of its entirely independent branch associations. These branch associations are chiefly concerned with costs, the settlement of agreements, and fixing of prices. The enormous variety of machinery products causes the individual manufacturer, in particular the medium-sized and smaller ones, extraordinary difficulties when attempting to fix an adequate price, in correct relationship with prime cost and marketing conditions. The establishment of costs, especially with new designs, causes extreme difficulties. As the average and small works cannot each keep a staff of specialists and statisticians for these problems, their settlement by the associations is the natural outcome.

Courtesy Crompton & Knowles

A LESSON IN OBSOLESCENCE

One Massachusetts textile manufacturer decided his equipment, obsolete for years, needed revamping. Instead of replacing it over a period of years, he decided to do the job completely. Here's the result—which may prove a valuable object lesson

Spain Reduces Duty on Auto Parts

Lower tariffs on automotive vehicles, imported unassembled for completion with elements of Spanish manufacture, went into effect in Spain last week, according to information released by the U. S. Department of Commerce. The reductions in duties, the report states, are intended to promote the development of Spanish automotive construction under a plan which will lead eventually to the use of Spanish parts exclusively in the assembly plants.

John A. Edlund

JOHN A. EDLUND, 64, president and general manager of the Gooley & Edlund Co., Inc., manufacturer of sensitive drill presses and precision equipment, Cortland, N. Y., died there July 17, following an illness of several months. He was a native of Sweden and for more than six years prior to organizing Gooley & Edlund had been identified with the Smith Premier Typewriter Co.

Italian Machinery Exports Decline in 1930

As a result of the pronounced general slackness in all Italian industries during 1930, sharp reductions occurred in Italy's imports and exports of industrial machinery and equipment as compared with the record totals established in the previous year, according to a report received in the United States Department of Commerce from Assistant Commercial Attaché, A. A. OSBORNE at Rome. Imports of this class of goods in 1930 amounted to $27,000,000 as against $34,210,000 in 1929, while exports totaled $8,824,000 during 1930, as compared with the preceding year's figures of $9,754,000.

Imports of machine tools, as well as equipment for making construction and road-building material, fell off to a marked extent. Imports of steam boilers, as of other steam-plant accessory equipment, were greater in 1930 than in either of the two preceding years. Imports of machine tools from the United States, as compared with other lines, made a more favorable showing, amounting to 1,024 metric tons in 1930, as compared with 1,281 tons in 1929.

Kearney & Trecker Holds Miller Show

Kearney & Trecker Corporation, holding its own milling machine show in Milwaukee last week, planned for 200 guests during the week; in spite of the record-breaking heat, 889 were registered altogether, including men from most major industrial organizations in all parts of the country and even from foreign countries. A special guidebook was prepared for the occasion, loud speakers were installed in the shops so that each machine might be explained to all present, and on last Thursday, when the heat wave reached its peak, blocks of ice were carted into the plant, electric fans turned on behind them, and men set to work sprinkling the roof with fire hoses. According to one of the *American Machinist* representatives, the stunts with ice, fans, and firehose were necessary. Said he, "They needed 'em—or they'd have killed off a lot of live prospects!"

BUSINESS ITEMS

The Northern Engineering Works, 210 Chene St., Detroit, Mich., has appointed R. E. Condit, with offices at 901 East Third St., Dayton, and at 705 Gwynne Bldg., Cincinnati, as represenative for traveling cranes, electric hoists and other equipment in the Dayton, Cincinnati and Columbus districts of Ohio. The company has also appointed the Hill Equipment Engineering Co., 4620 Delmar Blvd., St. Louis, as representative in that district.

E. Ingraham Co., Bristol, Conn., has acquired patent rights of the Hansen Manufacturing Co., Princeton, Ind. The move is made to secure rights to manufacture electric motors for electric clocks.

The Jessop Steel Co., Washington, Pa., is installing another electric melting furnace, two new annealing furnaces and a forging hammer, and is extending its buildings to take care of these improvements.

The Central Specialty Corporation has been organized at Westfield, Mass., for general work and jobbing, cutter salvage, grinding, and metal spraying. S. F. CUSHMAN, JR., is president and general manager, and CHARLES H. SPENCER, treasurer. Mr. Cushman will retain his connection with the Perkins Gear Company.

The Ero Manufacturing Co., 2234-40 Ogden Ave., Chicago, Ill., manufacturer of automotive accessories and specialties, has leased the seven-story and basement building at 714-18 West Monroe St., containing about 110,000 sq.ft. of floor space for a term of years.

Alfred Herbert, Ltd., Coventry, England, have appointed J. C. BLAIR as director of dealer relationships. Mr. Blair will visit the United States soon.

The Illinois Steel Company plant at Joliet, Ill., closed June 27, was reopened July 13 and more than 1,000 men returned to work. Steel officials said there were no large orders on hand but only an accumulation of small business.

Western Electric Co., Chicago, for the third successive year is giving employees a mass vacation, and 45,000 this week and next will be away. Only a small number is remaining at the Hawthorne works for emergency work.

The entire factory and office of the Alemite Corporation, 2650 North Crawford Ave., Chicago, Ill., will be closed from August 22 to September 7 for the annual vacation period.

The Tobrin Tool Co., Plantsville, Conn., has purchased the plant formerly occupied by the Eastern Specialty Co., Southington, Conn. WILLIAM S. THOMSON, president, expects to move the Tobrin business into the new quarters by August 1. Grinders, bench saws, and other tools are manufactured.

The Milholland Sales Engineering Co., Indianapolis, Ind., announces the removal of its general offices and factory from the former address at 1833 Ludlow St., to 1145 East 22nd St., the same city. The move was for the purpose of securing larger and more efficient manufacturing space.

All Cincinnati offices of the Armstrong Cork Co. were consolidated at 232 West Seventh St. on July 20, bringing together all sales divisions for its varied line of cork products, insulation and floor coverings.

The Fort Pitt Flask Equipment Co., has been organized by C. H. CURRY, Coraopolis, Pa., H. J. KOCH, Pittsburgh, Pa., and C. S. KOCH, Edgewood, Pa., with a capitalization of $250,000, to manufacture foundry flasks.

The Van Doorn Corporation has been organized as successor to the Van Doorn Co., Third & Broadway, Quincy, Ill., and will manufacture elevator cabs exclusively. E. J. DOYLE is president and A. J. STEGEMAN, vice-president and works superintendent.

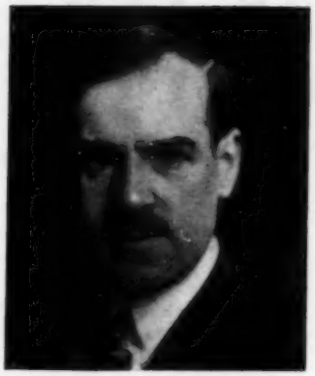
The Holmes & Edwards Division (Bridgeport), of the International Silver Co., will be closed down as soon as convenient and the plant equipment transfered to Meriden, Wallingford or Waterbury. It is planned to employ the Bridgeport working force in the other plants when conditions justify it.

Effective July 1 by mutual agreement the agency contract between Paul H. Petersen, Inc., 420 Lexington Ave., New York City, and Joseph T. Ryerson & Son, Inc., was terminated, and all export business of the latter concern will be handled through its Jersey City, N. J., office.

The Atlas-Ansonia Co., New Haven, Conn., metal specialties, has purchased the Mt. Carmel [illegible]g. Co., which is engaged in the manufacture of a similar line.

PERSONALS

RICHARD L. BINDER, president, Metals Coating Co. of America, Philadelphia, sailed for Europe to study economic conditions in Germany and visit the company's plants in Hamburg and Berlin. He was accompanied by DR. LEOPOLD PESSEL, chemist and metallurgist of the company.



FRANK J. BAUMIS

FRANK J. BAUMIS, formerly vice-president of Manning, Maxwell & Moore, Inc., and more recently of the Ingersoll-Rand Co., has organized The F. J. Baumis Co., with offices in New York and Boston, to specialize in highway equipment for railroads and their affiliates, representing the Warford Highway Transportation and allied lines. Mr. Baumis has had long experience and association with railroad operations and equipment.

C. F. BARTH, vice-president and director of manufacturing, Chevrolet Motor Car Co., Flint, Mich., has retired, and has been succeeded by C. E. WETHERALD, formerly assistant general manufacturing manager. F. O. TANNER, formerly in charge of manufacturing operations in Detroit and Toledo has been appointed assistant general manufacuring manager to succeed Mr. Wetherald.

CHARLES A. DARLAND, sales manager of the John Deere Wagon Works, was retired under the company's pension plan on July 1, after 35 years of service. He was first associated with the South Bend Wagon Co., which was later absorbed by Deere & Co., and his service in the latter concern was made retroactive.

M. L. ECKMAN, a development engineer with the Federal Machine & Welder Co., Dana Ave., Warren, Ohio, sailed on July 18 to supervise the installation of welding machinery in France, England, Germany and Italy. Mr. Eckman will assist in training the welding personnel of such manufacturing concerns as Renault, Citröen, Fiat, Krupp and others.

J. M. HIPPLE, newly elected general works manager of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has announced changes in the duties of four of his executive personnel. These changes are as follows: ALEXANDER TAYLOR, assistant to the vice-president, has been assigned to duties concerned with the Pennsylvania railroad locomotive contract, and is succeeded by H. C. THOMAS, director of manufacturing stocks. E. R. NORRIS has been appointed assistant to the general works manager. C. G. BUNNELL, formerly purchasing agent at East Pittsburgh, will now function as general purchasing agent, as noted last week.

EUGENE C. CLARKE has been elected president of the Chambersburg Engineering Co., Chambersburg, Pa., succeeding WILLIAM HERBERT DERBYSHIRE, JR., who has become chairman of the board. ARTHUR G. DICKSON has been made vice-president.

DAVID GEISSINGER, who has been direct factory representative in Pittsburgh for several machine-tool manufacturers, has become a special representative of the Fort Pitt Steel Casting Co., McKeesport, Pa.

C. N. JOHNS has been appointed general manager by the Page Steel & Wire Co., Bridgeport, Conn., with headquarters at Monessen, Pa. W. H. BLEECKER, JR. has been appointed sales manager with headquarters at 101 American Bank Bldg., Pittsburgh, Pa.

FRANK W. JONES, for many years Philadelphia sales manager of Eastern Steel Co., Pottsville, Pa., whose plant recently was sold in receivership, is now general manager of the Hanover Wire Cloth Co., Hanover, Pa.

DR. G. L. KELLEY, scientist of Harvard University, has been appointed to supervise research work in the manufacture of pressed steel coaches at the Pressed Steel Co. of Great Britain, London, England.

RALPH KELLY, southwestern district manager for the Westinghouse Electric & Manufacturing Co., has announced the appointment of L. S. WASHINGTON as manager of the northeastern section and E. D. STEWART as manager of the southwestern section of the district.

E. D. KASER has been elected president and general manager of the Durabilt Steel Locker Co., Aurora, Ill., to succeed C. W. KILLIAN, who resigned as president but remains as a board member.

WILLIAM J. KIBLER has been elected president of the Buffalo Steel Co., Tonawanda, N. Y., succeeding the late J. G. JOSEPH. Mr. Kibler will be succeeded by AUGUST E. KLINGER as vice-president.

LT.-COL. EARL MCFARLAND, Ordnance Department, United States Army, has been awarded the Distinguished Service Medal, the citation for which is as follows: "For exceptionally meritorious and distinguished service while in charge of the design, development and production of all machine guns, automatic rifles and accessories thereto during the World War."

C. A. MEIER, formerly merchandising manager of the Southwestern District for the Westinghouse Electric & Manufacturing Co., has been transferred to the Pacific Coast as regional sales manager, with headquarters in San Francisco. GEORGE BAILY, formerly Pacific Coast merchandising manager, has been transferred to Mansfield in the capacity of assistant to the sales manager. N. E. HARVEY has been appointed merchandising manager of the southwestern district with headquarters in St. Louis. R. L. DUVAL, formerly large appliance sales manager, Mansfield, Ohio, is now merchandising manager of the Middle Atlantic District, with headquarters at Philadelphia.

ARTHUR E. PAINTER, formerly with the Riverside Steel Casting Co., Newark, N. J., now is district sales manager for the Atlantic Steel Castings Co., Chester, Pa., with offices at Room 1908, 270 Lexington Ave., New York.

CARL B. RETTIG, who recently resigned as eastern district sales manager, Empire Steel Corporation, Mansfield, Ohio, became sales representative on July 1 of the Mahoning Valley Steel Co., Niles, Ohio.

G. D. SPACKMAN, president of Lukenweld, Inc., subsidiary of Lukens Steel Co., Coatesville, Pa., since its organization in July, 1930, has been appointed chairman of the American Welding Society's committee on the use of welded steel parts in the construction of machinery.

OBITUARIES

WARREN J. DAVIS, 75, former president of the J. I. Case Threshing Machine Co., Racine, Wis., died July 11 at the Harbor hospital, New York. Mr. Davis resigned the presidency of the threshing machine concern in 1924 and served as chairman of the board until February, 1926, when he retired.

WILLIAM H. FARNSWORTH, 83, chairman of the board of directors of the National Grinding Wheel Co., Tonawanda, N. Y., died July 12. He retired from active business in 1926.

J. R. FRANCIS, 60, founder of the Marvel Carbureter Co., Flint, Mich., died recently at Miami Beach, Fla. He was a vice-president of the Borg-Warner Co., Chicago.

D. BURDETTE LEWIS, 53, general superintendent of the Wrought Iron Range & Car Co., Morgantown, N. C., died of heat prostration July 3. He had been identified with the company for the past 30 years.

HENRY J. F. NIEMANN, 61, production manager and director of the Enterprise Foundry Co., San Francisco, died June 23. He was a pioneer in structural iron work and had been with the company for 41 years.

FAYETTE NIMS, 46, president and treasurer of the Cronk & Carrier Manufacturing Co., Inc., Montour Falls, N. Y., died July 5.

WILLIAM S. PERRIGO, 54, president of the Northwestern Molding Sand Co., Beloit, Wis., and the Lakeside Railway Signal Co., Rockford and Freeport, Ill., died July 3, at Rochester, Minn. Mr. Perrigo was also connected with the Woodruff & Edwards Co., gray iron foundry at Elgin, Ill., of which he had been secretary.

HENRY G. WERNIMONT, 61, president of the Wernimont Manufacturing Co., tool-making concern of Rochester, N. Y., died July 6.

MACHINE REQUIREMENTS AND INDUSTRIAL CONSTRUCTION

Opportunities for Future Business

Ill., Bellewood—Jefferson Electric Co., 15th and Laflin Sts., Chicago, will soon award the contract for the construction of a 1 and 2 story, 325 x 650 ft. factory, here. Estimated cost $550,000. Olsen & Urbain, 228 North La Salle St., Chicago, Archts.

Ill., Chicago — Sidney Wanzer & Sons, 124 West Garfield Ave., is having plans prepared for the construction of a 1 and 2 story, 200 x 418 ft. mill refrigerating depot, office building and garage for 150 trucks at Argyle St. near Lincoln St. Estimated cost $125,000. R. Griesser, 64 West Randolph St., Archt.

Ill., Peoria—Bd. of School Inspectors, G. T. Mowart, Secy., 300 North Monroe St., will receive bids about Sept. 1, for the construction of a 2 and 3 story, basement, 250 x 450 ft. junior high school including shops, etc. Estimated cost $800,000. Hewitt, Emerson & Gregg, Peoria Life Bldg., Archts. Noted May 14.

Ind., Indianapolis—Standard Oil Co., 137 West 11th St., awarded the general contract for the construction of a super-service station, at 5665 East Washington St. Estimated cost $40,000.

Ind., Terre Haute — Vigo Automobile Co. awarded the general contract for the construction of a 2 story, basement, 100 x 140 ft. machine shop and garage, at 8th and Mulberry Sts. Estimated cost $41,000.

Mass., Barnstable—E. H. Corson, Sixth and Elm Sts., awarded contract for the construction of a 1 story, basement, 65 x 100 ft. service station and showroom, at Barnstable Rd. and Lewis St. Estimated cost $50,000 or more. Noted July 9.

Mass., Boston—City, Dept. Public Buildings, is having preliminary sketches made for a 1 story garage for Police Station No. 14, at Washington St., Brighton. Estimated cost $40,000. J. M. Gray, 175 High St., Archt.

Mass., Boston—Royal Curtain Mfg. Co., 35 Kingston St., awarded contract for the construction of a 2 story factory, at Hyde Park Ave., Hyde Park. Estimated cost $40,000.

Mass., Lowell—Marden & Murphy, Inc., 15 Kearney Sq., had revised plans made for a 1 story, 100 x 125 ft., repair garage storage building at Jackson St. Estimated cost $50,000. Davis & Byam, 420 Hildreth Bldg., Archts.

Mass., Pittsfield—Pittsfield Electric Co., W. A. Whittlesey, Pres., 92 Renne Ave., had plans prepared and will receive bids about July 21 for the alteration and construction of a 3 story garage and service building addition at Pearl and Eagle Sts. Estimated cost $50,000. Private plans. Noted July 2.

Mass., Springfield—City, C. J. Morrow, chn. building comn., will receive bids until July 30, for the construction of a 3 story, basement technical high school, at Elliot St. Estimated cost $400,000. F. W. S. King and E. C. G. C. Gardner, 33 Lyman St., Archts.

Mo., Jefferson City—Missouri State Highway Dept., c/o Maintenance Division, awarded contracts for the construction of 30 maintenance buildings.

Mo., Springfield — Missouri State Highway Dept., Jefferson City, will soon award contract for a division garage, here. T. H. Cutler, c/o Owner, Engr.

N. H., Manchester—Howard E. Hartman, Inc., 11 Prospeect St., had revised plans prepared for a 1 story, basement, 110 x 170 ft. public garage at Elm and West Brook Sts. Estimated cost $50,000. A. W. Osberg, 795 Elm St., Archt. Noted Nov. 13.

N. J., Allwood—Ballinger Co., Engrs. and Archts., 12th and Chestnut Sts., Phila., Pa., revising plans and will soon award contract for altering a 2 story, basement plant here, for American Colortype Co., 207 West 25th St., New York, N. Y. Estimated cost $40,000. Noted June 25.

N. J., Bloomfield — General Electric Co., Laurence St., is receiving bids for a 1 story, basement factory addition. Estimated cost $40,000. Private plans.

N. J., Bogota — F. L. Smith, Archt. and Engr., 21 East 40th St., New York City, is receiving general contract bids for the construction of a 1 and 2 story, basement industrial building for G. M. Brewster & Son, 253 West Fort Lee Rd. Estimated cost $40,000 or more.

N. J., Paterson—J. C. Van Vlandren, Archt., 140 Market St., is preparing plans and will receive general contract bids about Aug. 1, for the construction of a 2 story, basement industrial plant, for Owner, c/o Architect. Estimated cost $40,000 or more.

N. Y., Brooklyn—M. Astorita, 302 Sackett St., had plans prepared for the construction of a 2 story service garage at Third Pl. and Court St. Estimated cost $75,000. Maturity about December or later. I. Brooks, 16 Court St., Archt. Noted July 9.

N. Y., Brooklyn—Belfax Building Corp., 26 Court St., will build a 100 x 170 ft. service garage at Grant St., by separate contracts. Estimated cost $40,000. M. Klein, 65 Court St., Archt. Noted July 9.

N. Y., Brooklyn—Camstall Construction Co., 50 Court St., will build a service garage at 88th St. and 4th Ave., by separate and general contracts. Maturity indefinite. P. Freshman, 50 Court St., Archt. Noted July 9.

N. Y., Brooklyn—Hilo Varnish Corp., Marcy and Flushing Aves., awarded general contract for a group of factory buildings, including 3 story, part basement, rein.-con. factory, three 1 story, structural steel buildings for storage, varnish cooking and thinning, at Stewart Ave. and Harrison Pl.

N. Y., Brooklyn—National Saw Dust Co., 69 North 6th St., awarded contract for the construction of a 2 story factory, at North 6th St. and East Kent Ave. Estimated cost $40,000.

N. Y., Brooklyn—Rand Rubber Co., Halsey St. and Sumner Ave., awarded contract for alterations and equipment for a 3 story factory. Estimated cost $40,000. M. Mario, 200 Beverly Rd., Archt. Noted June 25.

N. Y., Buffalo—A. F. Oliver Gear & Machine Co., 60 Cherry St., awarded general contract for the construction of a 1 story, 85 x 250 ft. factory addition. Estimated cost $39,000. Noted June 18.

N. Y., Jamestown—Jamestown Iron Wks., T. Maher, Pres., 11 Shearman Pl., plans the construction of a 60 x 100 ft. foundry addition at Taylor St. Estimated cost $50,000.

N. Y., Long Island City — Kalbirt Realty Corp., 26 Court St., Brooklyn, will construct a service garage, at 148th St. and Archer Ave. Estimated cost $40,000. Work will be done by separate contracts. Maturity indefinite. P. Freshman, 26 Court St., Brooklyn, Archt. Noted July 2.

N. Y., Maspeth—I. Fader, 826 Flushing Ave., Brooklyn, is having preliminary plans prepared for a 1 story, 100 x 100 ft. service garage at 54th St. and Flushing Ave. Estimated cost $40,000. I. Goldstone, 26 Court St., Brooklyn, Archt.

N. Y., New York—Kenjohn Realty Corp., K. P. Steinrich, Pres., 362 West 23rd St., will not construct a 6 story service garage at 435 West 25th St. Estimated cost $400,000. Project abandoned. L. E. Dell, Bogota, N. J., Archt. Noted Jan. 22.

N. Y., New York—Randco Realty Corp., E. Alpern, Secy., will build service garage and market, at Tiffany St. and East Bay Ave., by separate contracts. Estimated cost $40,000. Owner now taking bids on materials, separate contracts, etc. N. Rotholz, 155 East 42nd St., Archt. Noted July 9.

N. Y., Ossining—The Texas Co., Park Square Bldg., Boston, Mass., awarded contract for a bulk station, garage, pumphouse and warehouse, here. Estimated cost $40,000 or more. Private plans.

N. C., Durham — Southern Creosoting Co., plans the construction of an industrial plant for creosoting railroad ties, piles, poles and other timbers, at Hillsboro Rd. Estimated cost $150,000.

O., Cincinnati — University of Cincinnati, Clifton Ave., awarded contract for the construction of a 3 story, 56 x 112 ft. machine shop on campus. Estimated cost $100,000. Hunt & Allen, Eage Savings Bldg., Archts.

O., Cleveland—New York Central R.R., R. O. Rote, ch. engr. (lines west of Buffalo), West 3rd St. and St. Clair Ave., had plans prepared for a 1 story, 80 x 170 ft. engine house addition, at Collinwood Yards. Estimated cost $60,000. G. Herr, c/o Owner, Archt.

O., Zanesville—S. A. Weller Co., Cemetery Dr., awarded contract for the construction of a 1 story, 148 x 240 ft. pottery plant addition. Estimated cost $50,000.

Pa., Bradford—Kendall Refining Co. awarded contract for a cracking unit of an oil refinery. Estimated cost $350,000. Arthur G. McKee & Co., 2422 Euclid Ave., Cleveland, O., Engrs. and Contractors.

Pa., Sharon — Standard Oil Co. of Pennsylvania, W. E. Black, in charge, Peoples Gas Bldg., Pittsburgh, awarded contract for the construction of a 1 story, 32 x 54 ft. garage, 1 story, 30 x 80 ft. warehouse and 1 story, 14 x 20 ft. pump house, at Tanner St. and Nickle Plate R.R. tracks.

R. I., Richmond — Dept. of State Police, Everett St., will soon award contract for the construction of a 1 and 2 story, basement garage and police barracks. Estimated cost $50,000. Jackson, Robertson & Adams, Turks Head Bldg., Providence, Archts. Noted June 18.

Wash., Chehalis — State Dept. of Business Control, Olympia, soon lets contract for 2 story, two units, 46 x 80 ft. each, shop building at State Training School here. Heath, Gore & Bell, Tacoma, archts.

Wash., Seattle—Pacific Hoist & Derrick Co., awarded contract for machinery mart at Fourth Ave. South and Hanford St. Estimated cost $60,000.

Wash., Seattle — State Highway Dept., Olympia, awarded contract for one story shop building with mezzanine floor for machine and equipment parts, main floor for auto and truck repair shop, parts room, blacksmith shop, etc., cost $33,564.

Va., Langley Field—U. S. Army Air Corps., Constructing Quartermaster, Fort Monroe, awarded contract for 11 hangars, annexes, connecting bays and power house, here. Estimated cost $498,000.

B. C., Vancouver Island—Lone Star Timber & Pulp Co., D. A. Grover, Pres., Pioneer Drug Bldg., Seattle, Wash., plans the construction of a pulp mill, saw mill, veneer mill, shingle mill, etc. at Port Renfrew here. Estimated cost $6,000,000 to $8,000,000.

Que., Lachine—Jenkins Bros. Ltd., 617 St. Remi St., Montreal, awarded contract for iron and brass foundry and power house at George Fifth Ave., here. $375,000. Noted June 4.

Que., Quebec City—Motor Ltd., 19 Crown St., plans the construction of a garage addition. Estimated cost $25,000. Architect not selected. Maturity probably in September.

Que., Quebec City—Quebec Fire Vulcanizing Co., P. O. Dube, Mgr., 86 Crown St., plans a garage at St. John and D'Aiguillon Sts. Estimated cost $150,000. Architect not appointed.

Que., Three Rivers—Canadian Industries Ltd., Hamilton, plans the construction of a plant for the manufacture of cellophane, here. Estimated cost $1,500,000.

Equipment Wanted

Calif., San Diego—Public Works Officer, 11th Naval Dist.—will receive bids until July 28, for electric traveling bridge crane, capacity 5 tons, span of 46 ft. 5 in. center to center of runway rails, equipped with 3-phase, 220 volt, 60 cycle motors, for Naval Operating Base (Air Station). Spec. 6472.

Mich. Detroit — Superior Motor Rebuilding Co. 2325 Oakdale Ave. — machine shop equipment.

Mo. St. Louis—Teuscher Pulley & Belting Co., 801 North Second St.—heavy duty shaper 16 to 20 in. complete with parts.

Mont., Great Falls — Bd. Comrs. Cascade County, H. B. Lockhart, Co. Surveyor — one valve grinding machine, emery wheel and stand, motor connecting-rod aligner.